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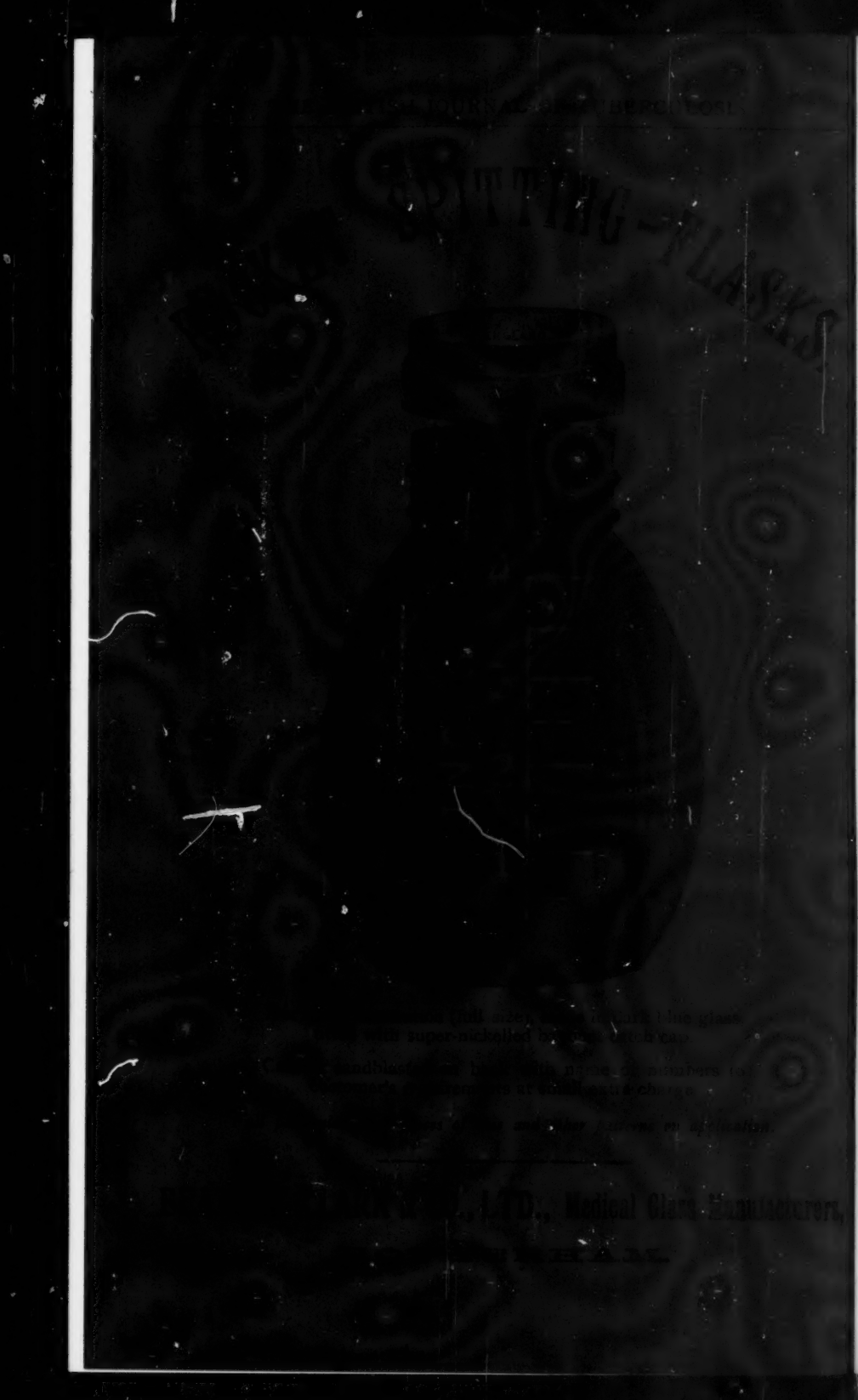

THE BRITISH JOURNAL
OF
TUBERCULOSIS

Vol. XXVIII. October, 1934. No. 4.

EDITORIAL.

ALLERGY.

THE controversy which has been raging about allergy is now acute, and the literature dealing with the subject is becoming gigantic. And yet the discussion might well be about the customs of the inhabitants of Mars, for facts are few and theories multiple. The very definition of allergy is not agreed, its relation to anaphylaxis is a matter of dispute, and whilst one school of thought regards it as a factor of immunity and beneficial, another states definitely that it has nothing to do with immunity, and indeed that it is actually harmful.

It was once suggested that a cat waved its tail when approaching a mouse in order to warn its prey, but Darwin rejected this theory as being against the usual custom of nature, and similarly we find it hard to believe that the inflammatory allergic reaction can have evolved in the course of nature for any purpose other than the protection or benefit of the individual.

Dr. Wingfield suggests that the allergic reaction, like most other things, is good in moderation but harmful in excess, and the very broadmindedness of his attitude adds weight to his arguments. He avoids the common mistake of regarding tuberculosis as something quite different from any other disease, for after all, what is Koch's phenomenon, what is the onset of sensitivity in tuberculosis but the end of the incubation period such as one sees in measles, typhoid or scarlet fever?

He also agrees that there are many modes of infection in tuberculosis, and not one only, but makes a strong case for his theory that an excessive allergic reaction may so injure the tissues that tuberculous infection finds a suitable soil for growth.

Dr. Nathan Raw's paper deals with a preparation of non-

virulent tubercle bacilli made by sub-culturing the bacilli for twenty-eight years, so that the present growth represents the three hundred and thirty-sixth generation and is non-pathogenic to animals. His experience suggests that this tuberculin gives partial or temporary immunity and checks or retards the rate of spread.

It is not easy to understand why the production of sensitivity may be obtained in one case and its elimination in another by giving tuberculin, and still less easy is it to believe that the correct treatment is to produce sensitivity in one and to destroy it in another patient.

If, however, we remember the old theory of moderation we can conceive that allergy is a virtue, which, like every other virtue, becomes a vice when pushed to excess.

Dr. Wingfield agrees that allergy is not the same as immunity even if there is some relation between the two, for it is possible to have one without the other. If therefore one can eliminate the allergic reaction it does not follow that this will have any effect on immunity, and Dr. Wingfield believes that a violent allergic reaction should be prevented by giving a course of tuberculin inoculations. His views certainly do explain the sudden appearance of secondary deposits in a lung or some portion of it previously unaffected, and it will be interesting to watch the result of his work along these lines.

ORIGINAL ARTICLES.

ALLERGY IN CHRONIC PULMONARY TUBERCULOSIS.

By R. C. WINGFIELD,
M.B., F.R.C.P.

Much attention has been paid to the study of allergy during the past few years, and what are held to be allergic manifestations have given plausible explanations of certain clinical and pathological phenomena in infective diseases, the nature of which had hitherto been puzzling. I feel that the time is ripe to consider the practical relation of allergy to chronic pulmonary tuberculosis, and in this paper I hope to show that by accepting the present conceptions of allergy and its functions it is possible to explain certain types of behaviour of the body infected by the tubercle bacillus in a way which may alter our attitude towards the disease, especially in the matter of assessment and prognosis. This alteration of attitude will automatically influence our treatment, and thus allow the academic study of allergy a practical application.

I am not sure that it is not presumptuous to do this. Our knowledge of immunology, which includes allergy, is still in its infancy, and the great mass of immunological work is still rightly in the hands of the scientists, being as yet insufficiently digested to be fit for practical use; but immunology is forcing its way into practical medicine and its intrusion will not be denied, so it would seem wise to try to adapt such scanty knowledge as we have got to practical ends.

On allergy our knowledge is extremely sketchy and ill-defined, and if its practical application is to be discussed some definition of it must be attempted, and its supposed cause, attendant phenomena, and functions described. Here I define tuberculo-allergy as an acquired specific sensitiveness of the body cells to an antigen that is produced by the tubercle bacillus. This sensitiveness is acquired by the cells soon after the bacillus has entered the body and has produced its first lesion; it persists as long as any foci of tuberculosis containing living tubercle bacilli remain in the body (except during the acute stages of some intercurrent diseases and during the terminal stages of tuberculosis). If fresh tubercle bacilli or certain of their products gain access to the allergic body, groups of cells which encounter the antigen in sufficient concentration respond with an allergic reaction.

What is the pathological nature of this allergic reaction? Macroscopically it is an area of acute simple inflammation, and microscopically, in mild reactions, the changes are those associated with slight simple inflammation, while in severe reactions cellular death and disintegration occur. Thus the tissue reaction of tuberculo-allergy is a simple inflammation and differs in no way from an allergic reaction to any other antigen; it has no specific histological features. But although the allergic reaction starts thus as a pure inflammation, when it follows the implantation of living tubercle bacilli this purity is probably of short duration. Two changes take place in a short time, possibly within a few hours. Firstly, the simple inflammation begins to subside, and secondly, the specific histological response of the tissues to the tubercle bacillus begins to appear, implanted in or superimposed on the simple inflammation, the size and speed of growth of the specific tubercular lesion depending upon the size of the infecting dose and the immunity of the host. Accompanying this tissue action there is probably always some constitutional disturbance, but in the case of tuberculosis there seems to be no hard-and-fast relationship between the intensity of the general disturbance and the size and intensity of the tissue reaction. After a subcutaneous, and sometimes after an intracutaneous, injection of tuberculin a patient may get a gross local reaction without constitutional disturbance or constitutional disturbance of a marked character without undue tissue reaction. This is true for tuberculo-allergic reactions in the dermal tissues, and it appears that the same lack of relation between the local and constitutional reactions is true also of those in the pulmonary tissues. We may therefore for practical purposes look on the allergic reaction as twofold, its two manifestations having no direct relation to one another: (1) A simple inflammation, culminating in cell destruction in severe reactions; and (2) a constitutional disturbance.

Allergy is a function of altered cell activity, due to some change in the cell, not to any change in the body fluid bathing the cells, for it cannot be passively induced. In a discussion on this point Dr. Cecil Bosanquet has suggested to me that, as in the primitive organism all cells had more or less the same properties, differentiated later into digestion, contraction, etc., so all or some of the tissue cells have some rudimentary digestive power left in them, and when they come in contact with a foreign protein they acquire the power of manufacturing a digestive ferment. When they receive subsequent doses of the foreign protein, which they are now able to digest, the products of this digestion act as an irritant, producing local simple inflammation. Apparently this subtle change in the cells is not evenly distributed throughout the body. Broadly speaking, those tissues which are nearer to the original or sensitizing tuberculous focus are more allergic than those at a

distance; and it is possible, too, that different tissues have different potentialities for becoming allergic.

The rôle of the tubercle bacillus in the production of allergy can be considered in relation to the various components into which it can be divided by chemical methods. Broadly these are: (1) the protein portion, (2) the lipin or phosphatide portion, and (3) the carbohydrate portion. Of these, it is now certain that it is the protein portion alone which produces allergy in the unallergic body and which can elicit allergic responses in the allergic body. The lipin and the carbohydrate portions do not possess this power. The lipin portion, mainly through the agency of its phthioic acid, produces cell proliferation and necrosis, constituting the essential features of the lesion of tuberculosis which we speak of as the giant-cell system or tubercle.

The functions of allergy and its value to the individual organism have been recently the subject of much controversy, and are still undecided. Is it a protective mechanism against the attack of the tubercle bacillus? In other words, is it a function of immunity? Some workers, among them Topley and Krause, hold that it is a function of immunity, and therefore protective. Others, notably Rich, hold that it has nothing to do with immunity, and is the reverse of protective—even harmful. In support of his contention, Rich has shown that it is quite possible to make immune animals unallergic without impairing in any way the degree of their immunity, and, conversely, that an animal can be made highly allergic without the development of any measurable immunity. His experiments at first sight seem very conclusive; but although they show that allergy and immunity can exist independently, I think we must wait for further knowledge before we can say that allergy is definitely not a function of immunity and that it is not protective. It is certainly the body's response to a foreign protein, and it seems safest for the time being to assume that the normal degree of allergy is protective and beneficial, being normal, but that hypo- and hyper-allergy may be harmful. For instance, in the case of an individual who gets a small fresh deposit of tubercle bacilli in his lung, if his immunity is great and his allergy normal the allergic reaction is small, and the bacilli may be quickly killed and removed without a specific lesion resulting, and the allergic reaction disappears without doing gross tissue damage. But even though his immunity is great, if he is hyper-allergic he will get a gross reaction with extensive tissue necrosis, which in the lung cannot be regarded as a harmless manifestation. The skin lesions produced in Rich's hypo- and hyper-allergic immune guinea-pigs are an instance of this. But whatever is the relation of allergy to immunity, I think that in our present state of ignorance it is not important from a practical point of view.

These preliminary considerations clear the ground for considering the clinical importance of allergy in pulmonary tuberculosis. One of the outstanding features of this disease is surely its unexplained pleomorphism, alike in its apparent onset, in its course, and in its termination, and I put forward the hypothesis that the clue to this may lie in the degree and type of allergy which each infected individual acquires.

When a group of tubercle bacilli is deposited in the lung of an allergic person, some sort of allergic response must occur. If he is hypo-allergic, it will be small; if he is hyper-allergic, it will be large. Further, in view of the twofold nature of allergy, whether the tissue reaction be small or large, he may or may not have an accompanying constitutional disturbance, although he is more likely to have one if the tissue reaction is gross. I have described elsewhere these new exudative deposits occurring during the course of pulmonary tuberculosis. Their appearance is sudden, and they appear in the X-ray film as rounded hazy homogeneous shadows without structure. If observed by serial X-rays these hazy shadows may disappear entirely, or as the haziness disappears the shadow may contract, lose its homogeneity, and become stippled and striated. Those that disappear entirely are presumably simple allergic exudative reactions in which no specific tubercular lesion has been implanted. Those that change into contracted stippled shadows are presumably those in which a specific tubercular lesion has been implanted, and it is this which casts the stippled shadow when the haze of the allergic reaction has disappeared. On the X-ray film these shadows of allergic foci vary in size from a point so small that its nature can only be surmised to a huge opacity occupying half or three-quarters of a lung-field. Within rough limits the constitutional disturbance that accompanies them does vary with their size, but with even quite large ones it may be mild and of very short duration. Three types of temperature reaction may occur (Figs. 1, 2, 3), and the most easily overlooked disturbance (Fig. 1) will often accompany quite large tissue reactions casting a shadow as big as an apple.

Now it would appear logical to say that the size and intensity of these lesions depend largely on the state of allergy of the individual's pulmonary tissue. Their subsequent history should depend largely on his degree of immunity, but it would also appear probable that if the local reaction was very severe, with widespread tissue destruction, there would be afforded a much more suitable terrain for the spread of the tuberculous lesion if his degree of immunity was not sufficient to deal with the original deposit of bacilli. According to this view the possession of hyper-allergic pulmonary tissue predisposes to spread of disease, and also has a baneful influence on the new lesions so formed. If this is true it is obviously important to recognize hyper-allergy and to recognize the allergic reaction without delay, so that treatment by

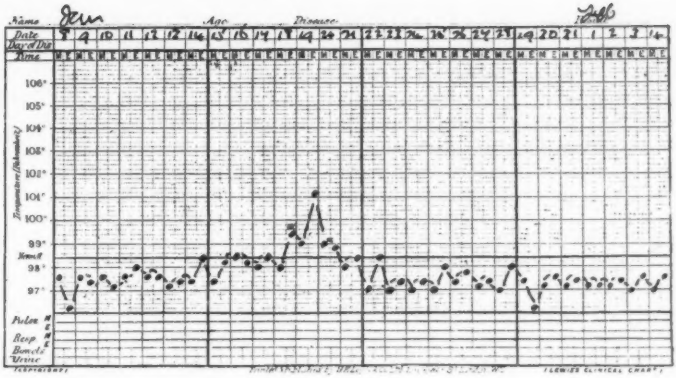

FIG. 1.

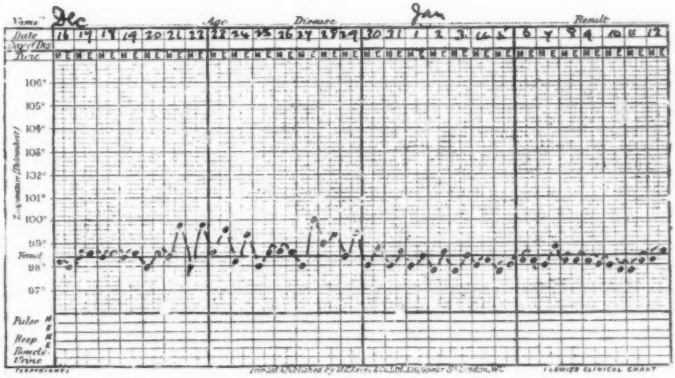

FIG. 2.

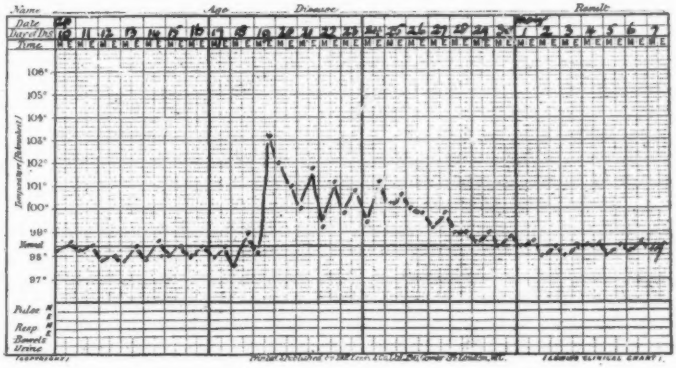

FIG. 3.

FIGS. 1, 2, 3.—SHOWING THREE TYPES OF TEMPERATURE DISTURBANCE THAT MAY ACCOMPANY THE LEPOSIT OF AN ALLERGIC FOCUS IN THE LUNG.

immediate and complete rest may perhaps minimize its intensity and lessen the tissue damage it may produce. It is common knowledge that the human body can carry quite a large tuberculous lesion of the lungs without symptoms arising therefrom. This tolerance may itself constitute a source of danger. If a patient who acquires a new pulmonary deposit of bacilli has *low* allergy and *high* immunity all is well; the bacilli are dealt with and a minimal healing lesion results. But if he has high allergy and normal or low immunity, and especially if his allergy is of a type that does not produce constitutional disturbance, then things may go hardly with him, for the new lesion that is formed will be large and, since it gives but little evidence of its presence, diagnosis and treatment will be delayed until ineradicable damage has been done.

Hyper-allergy, although it may produce a rather damaging lung lesion, does by its constitutional symptoms tend to aid diagnosis, but it is a dangerous feature that these constitutional symptoms are in most patients slight and transient. However, if this fact is recognized and the danger fully appreciated, careful observation should always prevent such extensions escaping detection in the diagnosed case. In the undiagnosed case they will be nearly always ignored by the patient.

Thus we can recognize two distinct forms of spread of disease in pulmonary tuberculosis:

1. By fresh deposits implanted in allergic reactions which do give some hint of their arrival, slight though it may be; and

2. By direct extension, without allergic reaction, of a lesion already present—an extension which is often quite symptomless for many months, but which, on the other hand, is quite easily detected if serial X-ray examination is used as a routine.

In fact, we are exposed to two separate methods of attack by the tubercle bacillus; in one the protein moiety of the micro-organism plays the chief part, in the other the lipin moiety. The acceptance of this view should simplify the problems of treatment and particularly of after-care, and should teach us that the only safe procedure is to watch the clear areas of the lung-fields and the behaviour of existing lesions very closely by X-ray rather than depend, as we do at present, on objective and subjective symptoms, which in most cases appear too late to be of any practical use.

The measurement of the degree of allergy in any particular patient should then be of great value in gauging his prognosis as far as relapse due to the appearance of new lesions is concerned. The quantitative Mantoux test has been used for this. In the examination of South African negro miners it was actually found to be of some value in prognosis; there was a much greater likelihood of the appearance of clinical

tuberculosis among those who showed a high degree of skin allergy. Among Europeans it has been frequently tried, but up to now without success. No definite correlation has been found between the skin sensitiveness and the clinical condition of the patient. I have myself attempted to find some relation between the skin sensitivity and the immediate and remote past histories in a series of patients (noting especially evidence of allergic spread in the history) without any success. The problem might be attacked by taking periodical surveys of skin-sensitiveness of a large series of patients over a period of about five years, and comparing this with the relapses among them due to allergic spread. There are, however, three possible sources of error in such investigations:

1. Allergy may be, and probably is, unevenly distributed among the tissues, and therefore the skin sensitiveness may not be a measure of the lung sensitiveness.

2. Allergy may vary in degree in any one individual from time to time.

3. The degree of immunity in any individual is an unknown quantity, and a high degree of immunity should nullify the danger of a high degree of allergy.

I do not wish to suggest that it is allergy and nothing but allergy that determines the response of the body to invasion by the tubercle bacillus. I place equal importance upon immunity and the size, frequency, and tissue distribution of the infecting dose, to mention only a few factors; but I do put forward a plea for the recognition of the importance of the state of allergy, especially with regard to the type of extension and to its appropriate treatment.

In conclusion I should like to touch on a broader problem. It is now agreed, I believe, that there is no genetic difference between the different races of man in their response to infection by the tubercle bacillus, but that the very great differences in response that do occur depend in large measure on the length of their racial experience of tuberculous infection. The shorter the racial experience the more acute the response. Of the moieties of the tubercle bacillus the protein, the allergy producer, is the only one that can produce an antibody; the lipin, the specific lesion producer, cannot. Does it not seem possible, then, that a prolonged racial experience of tuberculous infection may breed a generation which is relatively immune to the protein moiety, and therefore relatively hypo-allergic, but which has developed much less or no immunity to the lesion-producing, non-antibody-forming lipin moiety? Could not this explain the acute disease of the primitive; the semi-acute disease of the recently civilized, such as the South African and the American negro; the chronic disease of the European; and the almost inert, though grossly destructive, tubercu-

losis of the Chinaman with his civilization centuries older than ours?[1] Could not this also explain the different degrees of allergy found in individual Europeans? For with all the changes and chances of indiscriminate breeding, hereditary characteristics must always appear in different strengths in different individuals.

A NEW IMMUNIZING VACCINE FOR THE PREVENTION AND TREATMENT OF TUBERCULOSIS.

By NATHAN RAW,

C.M.G., M.D.,

Late Member of the International Tuberculosis Commission.

I HAVE been invited to write a short account of an attenuated vaccine which I have been growing in the laboratory for the last twenty-eight years, and which is being used at the present time for immunization of calves and in the treatment of suitable cases of tuberculosis in humans.

After treatment of 1,250 cases in hospital with Koch's tuberculin, I was impressed with the toxic properties of this tuberculin, so I decided to attempt to attenuate the bacilli by artificial culture in the laboratory.

Attenuation of Tubercle Bacilli extending over a Period of Twenty-Eight Years.

In 1906 Professor Koch gave me, in Berlin, a pure culture on glycerin agar of human bacilli from the sputum of an advanced case of pulmonary tuberculosis. Professor Calmette supplied me with a pure culture of bovine tuberculosis obtained from the mesenteric glands of a cow, and Professor Bang gave me a pure culture of avian bacilli from the liver of a chicken.

These cultures have been subcultured on glycerin potatoes and then transferred to glycerin agar every month for twenty-eight years in my laboratory, and the present growths represent the three hundred and thirty-sixth generation.

The growths are still profuse, but they are quite non-tuberculigenic and completely non-pathogenic to animals. Every year since 1906 I have injected these bacilli into animals with a view to testing the pathogenicity of the human and bovine types. Until the year 1912—

[1] Hall and Chang, *American Review of Tuberculosis*, August, 1934.

that is, the eighty-fourth generation—I noticed no change in their virulence. After that time attenuation became marked, and in a series of animal inoculations in 1913 and 1914 they were observed to be avirulent.

The war interfered seriously with my experiments, but I took the cultures to France, and continued the work there for four years, inoculating hares, rabbits, and guinea-pigs in 1916 and 1917. The cultures were in all cases non-pathogenic. Large numbers of animals inoculated have shown the same results.

These experiments conclusively prove that virulent bacilli can be attenuated to such a degree as to be avirulent and non-pathogenic to highly susceptible animals.

The present growths of the bacilli have, during the last year, shown a tendency to assume the cultural characteristics of the bovine growths. The present cultures, which have been subcultured every month for the last twenty-eight years, and represent the three hundred and thirty-sixth generation, grow true to type and are luxuriant in growth, have lost all virulence and are non-pathogenic to all animals, have very important immunizing properties and are now in constant use for immunization of calves and also in the treatment of suitable cases of tuberculosis.

Method of Preparation of Tubercle Vaccine R.

Immediately the attenuated culture is received in the laboratory the mass of living organisms is collected from the surface of the glycerin agar on which it has been grown into a tared vessel. In this it is killed by heating for one hour at 60° C. on four successive days. The killed culture is then dried at the lowest possible temperature in a vacuum drying oven. When dry the weight of the tubercle bacillus is ascertained. The mass is now triturated until a sufficiently fine powder is obtained, from which the stock suspension representing 1 mgrm. dried tubercle bacillus per c.c. in sterile saline solution containing phenol 0·5 per cent. and glycerin 30 per cent. is prepared. The course of veterinary immunizing vaccine consists of two doses, each 0·2 mgrm., prepared from avirulent human bacilli.

The prophylactic and treatment course for human use consists of graduated doses, twelve in number, prepared from attenuated avirulent cultures of bovine bacilli:

Mgrm.	Mgrm.
0·001	0·007
0·002	0·008
0·003	0·009
0·004	0·010
0·005	0·012
0·006	0·025

The vaccine is prepared in the laboratory of Messrs. Allen and Hanbury.

General Conclusions.

After a large experience in the treatment of tuberculosis in all its forms I have come to the firm conclusion that tuberculin is a valuable remedy in a great many cases. The special variety of tuberculin to be used must be determined by the nature of the infection with which we have to deal; and as nearly all cases of pulmonary tuberculosis or consumption are of human origin—that is, they are caused by the bacilli of the *typus humanus*—it is necessary to use a tuberculin prepared from bacilli of the *typus bovinus*, and named bovine tuberculin. In fact, we must inject the opposite kind of tuberculin. Bovine tuberculin is less irritating and less liable to produce reaction when given in the larger doses in cases of consumption.

Tuberculin is not a specific remedy in severe tuberculous infections. Combined with other methods of treatment directed to raise the general nutrition, it assists in producing immunity of a more or less temporary character; but its chief effect seems to be to prevent the further spread of the disease and to inhibit the growth of the bacilli in the human tissues, so that as the original tuberculous process dies out no further development takes place. In other words, it has a specific action on the blood in retarding the growth of the tubercle bacilli. The immunity which it produces must be arrived at slowly and with caution, so that the blood may be very gradually accustomed to its presence, and it cannot be too strongly emphasized that all tuberculous infections, of however mild a type, become constitutional or blood infections in a very short time, as is evidenced by the cuti-reaction of Von Pirquet. In fact, the milder the infection of the human body, the greater the reaction after inoculation with tuberculin.

It is a matter of common experience that a child with a small tuberculous neck gland will give a well-marked cuti-reaction, whilst an advanced case of tuberculosis may give rise to no reaction at all.

I would like here to sound a note of warning against the use of tuberculin by injection in cases where there is any encysted pus or tuberculous material in a state of caseation. Unless there is an outlet for this caseating débris there is danger of local reaction, with dissemination of the bacilli and a possible blood-stream infection. In suppurating tuberculous glands of the neck the pus should be removed first, and then tuberculin may be given with safety and benefit.

In conclusion I would like to express my opinion, after treating over 1,600 patients with injections of tuberculin, that it is a remedy of the greatest value, especially in early cases and where the deposit of tubercle is localized, as in one apex or a lymph gland or single joint; but where the tuberculosis is disseminated and complicated by second-

ary infections, the use of tuberculin cannot be expected to be of much avail. It ought, however, to be tried in every case with the hope of some relief or possible benefit, as we cannot allow the patient to suffer and die without making every effort to arrest the progress of the disease.

Tuberculin is not going to revolutionize the treatment of tuberculosis. It is a valuable aid to the other methods of treatment; hence it must be used with care and discrimination, and with a full knowledge of its dosage and therapeutic effects.

In a number of cases where sanatorium treatment was not possible excellent results were obtained in localized tuberculosis of the glands and skin by tuberculin alone, and in several early lung infections tubercle bacilli disappeared from the sputum after three or four courses of tuberculin, with apparent complete recovery.

I would conclude by saying that the best treatment we can offer to-day to a person infected with tuberculosis is a prolonged open-air life, preferably in a well-conducted sanatorium, excess of nutritious food, gentle exercise followed by plenty of rest, and a course of tuberculin given by a careful physician. By using attenuated tuberculin, reactions are rarely observed, and I have never seen any ill-effects follow if it is given in carefully graduated doses, at intervals of one week between each injection, under the skin over the triceps muscle.

A PRELIMINARY REPORT ON A NEW METHOD OF TREATMENT FOR CASES OF PULMONARY TUBERCULOSIS.

By GORDON TIPPETT,

M.B. LOND.,

Medical Superintendent, Nordrach-upon-Mendip Sanatorium.

It will have been noticed that at the recent meetings of the Tuberculosis Association and of the National Association for the Prevention of Tuberculosis some very different views were expressed as to the value of existing methods of treatment. This was especially true in the discussion on "The Palliative Treatment of Advanced Pulmonary Tuberculosis." From this discussion it would appear that there is a certain measure of agreement that little can be done for these advanced cases beyond the relief of their most distressing symptoms and making them as comfortable as possible. Yet it was stated that the outlook is very different for those cases which have not reached the advanced stage. It is stated that the mortality rate has shown

a steady decline for some years. Some attribute this to present methods of treatment; others declaim against the routine treatment of the average case, and aver that our sanatoria are not worth the money spent on them.

In a recent article we are told: "You all know of the greatly improved prospect following upon the application of collapse treatment in pulmonary tuberculosis, and the more this prospect is placed before the public the better, because then sufferers from pulmonary tuberculosis will wish to submit themselves and their lungs to a critical examination, and at a much earlier stage than hitherto, in order that they may get the benefit of the collapse treatment rather than the distress of useless sanatorium treatment."[1]

I have myself drawn attention to the great value of collapse treatment: "The results obtained are satisfactory in so many cases that it is right to record the fact."[2]

Unfortunately, only a small proportion of cases come under these special conditions (the disadvantages of which were emphasized by Lord Astor in his address to the National Association meeting), and for the ordinary average case the outlook is black, since it would appear to be only a question of time until they succumb to the disease. It is in these circumstances that I have thought it desirable to submit these preliminary notes on a new method of treatment, which a great many years' experience in the treatment of tuberculosis permitted me to believe contained important possibilities.

In the past we have mainly concentrated on the bacteriological side of the problem, overlooking the other side—viz., that of the human body, which has to defend itself against these germs after they have infected the body. It is generally accepted that in all civilized communities every person is infected at one time or another. Whether the disease we call tuberculosis will follow this infection must depend not only on the virulence of the infecting germs and on their number, but also on the individual powers of resistance. These powers of resistance will probably depend on the state or composition of the blood, the various glands of internal secretion, and the tissues concerned.

It may be true that if we can so alter this human medium that it will no longer provide a suitable ground for the growth of these tuberculosis germs, then in time we should reduce the virulence of them, and finally inhibit their growth altogether.

It is not without interest that an investigation made at the University of Strasbourg has shown that when tubercle bacilli were grown on the usual media, to which had been added some of the material used in the treatment to be described, such bacilli tended to lose their acid-fastness, and, when injected into guinea-pigs, were no longer capable of setting up tuberculosis in these laboratory animals. This

work is now in process of repetition in an institution in London, with results which, up to the present, confirm the findings of the Strasbourg laboratory.

Later on it is hoped to be able to show that the method about to be described consists of an attempt so to alter the human medium that the tuberculosis germs can no longer flourish. The treatment is given by the mouth, and there are various tablets which are given in a certain definite sequence. The tablets are of three kinds—namely:

1. A sulpho-guaiacolic acid precipitate from antitubercular blood plasma, with 0·00004 gramme Koch Old Tuberculin to each 0·0025 gramme precipitate, called "Nordalin A."

2. A sulpho-guaiacolic acid precipitate from antitubercular blood plasma, called "Nordalin B."

3. An organic sulphonic acid precipitate from the subcutaneous tissue and reticulo-endothelial cells, called "Recytel."

There are no injections of any kind, and this naturally appeals very much to the patients, whom I find as a rule dread injections.

Last year Dr. Joseph Weill, Chef de Clinique des Hospices Civils de Strasbourg, Dr. Jacques Meyer, of the University of Strasbourg, and Dr. Zimmer, in charge of the surgical tuberculosis wards of the Hospice Stephanie, showed cases that had been treated by this method, and as the results seemed to be so extremely successful, I decided to make a trial of this treatment at the Nordrach-upon-Mendip Sanatorium early this year. I have treated some 21 patients by this method. Of course these patients were started at various times, and are therefore in various stages of treatment.

Tubercle bacilli were found in the sputum of 14 cases. In the 7 cases where no tubercle bacilli were found the diagnosis was confirmed by X-rays in 5 cases, and the physical signs in the remaining 2 cases were such as to leave no doubt as to the presence of tuberculosis.

At Strasbourg the treatment usually consisted of a course of tablets given over a period of some three months in the early acute cases of pulmonary tuberculosis, and longer in the non-pulmonary and in the chronic advanced pulmonary cases.

None of my cases were early acute ones, and most of them were very advanced, with destruction of lung tissue on one or on both sides. Two cases had had previous ulcers in the stomach and the duodenum respectively, and both were, within a week or two, able to take ordinary food without any discomfort.

Of the 21 cases, 14 have had treatment for at least three months, and these cases have all done well, and in no case was the patient's condition made worse. Time is required to show whether the tuberculosis will be permanently arrested. The remainder have not been under

treatment for as long as three months, but they have all improved.

In most cases the temperature tended to become normal within a few weeks, and sputum, when present, gradually became less, and in most of my cases it ceased. Appetite was improved and weight put on, and an interesting fact was the marked effect on those patients who used to suffer from constipation. Their bowels now act regularly without any need for aperients. There is nothing dramatic in these records, but they do seem to show enough to justify a continuation of the treatment and a further trial in other cases.

CASE NO. 1.—Fifteen years' history. Bilateral and caseous disease, extensive in the right lung, with several cavities. T.B. present in sputum. Sedimentation test, marked acceleration. No X-ray taken before treatment, but this patient was considered to be quite beyond any treatment, had been gradually going down hill for months, and had had a number of severe hæmorrhages. Now up and about, able to take ordinary exercises, and has had no sputum for two months.

X-ray report shows that in the right lung the upper and middle lobes are very contracted and fibrotic, with multiple cavities, but no fluid levels in the latter. No normal lung tissue is seen in these lobes. No sign of any recent infiltration found anywhere. The left lung showed some fibrous scars in the apex and in the axillary region.

CASE NO. 2.—Bilateral disease, with cavitation in both sides, was rapidly spreading, with profuse sputum and swinging temperature. Laryngitis, but no ulceration seen. T.B. present in sputum in large numbers. Outlook bad. Condition now very much improved, with normal temperature; up and about, taking regular exercise. Sputum much less.

CASE NO. 3.—Bilateral extensive disease. Sedimentation test, marked acceleration. Had a number of small hæmorrhages. T.B. present in large numbers in sputum. Within six weeks made a great improvement; able to get up and take ordinary exercise. No sputum.

CASE NO. 4.—Disease of many years' duration; with both lungs affected in all lobes. Cavity on right side. Been in other sanatoria. Told incurable. Resistance poor; sedimentation test, moderate acceleration. Had gold, with slight improvement for time. T.B. present in sputum in moderate numbers. Very depressed after slight hæmorrhage. Two months' treatment made good improvement.

CASE NO. 5.—Very extensive and spreading bilateral disease. T.B. present in sputum. Marked dyspnœa on exertion. Sedimentation test, marked acceleration. After a few weeks sputum almost ceased, after being present for over twelve months. Has made good progress.

X-ray report after six weeks' treatment and compared with X-ray taken twelve months before. There is considerable improvement in the condition compared with that found twelve months ago. The cavities at the right apex are much smaller and a good deal of fibrosis is present. The slight excavation under the left clavicle shows also signs of being obliterated by fibrosis. The diffuse mottled infiltration seen in both

lungs a year ago is largely disappearing and leaving more sharply defined miliary scars, indicating healing.

Case No. 6.—Bilateral disease in upper lobes, with more extensive lesions on the right, but with a cavity on the left. Little sputum, with no T.B. present. X-ray confirmed condition and as well showed a duodenal ulcer, causing delay in the emptying time of the stomach; also a chronic appendix.

After about twenty-one days' treatment all discomfort with food lost and able to take ordinary meals since. Made great improvement. After six weeks' treatment X-ray treatment showed left lung with fibrosis extending from hilum up to apex. Small cavity in upper zone surrounded by dense fibrosis. Left lung showed dense fibrosis in upper zone, with marked contraction of upper lobe. Some coarse mottling is seen in upper part of lower lobe behind.

Case No. 7.—Bilateral disease. Tuberculosis officer reported extensive infiltration throughout left lung, with hazy appearance, suggesting extreme activity. Slighter infiltration in the lower two-thirds of right lung. Definite disseminated tuberculosis. T.B. present in sputum. X-ray confirms report. Has done very well; put on a stone in weight. X-ray now shows a marked improvement. Right lung has some fibrosis with a few scattered healed nodules, particularly at right base. The majority of the infiltration previously seen in the left lung has disappeared; some fibrosis is evident, and the only lesion which is probably still "active" is an area under the left clavicle, the appearance of which suggests a thin-walled cavity, which is tending to close by fibrosis. Sputum has ceased for over two months now.

Case No. 8.—Bilateral disease of long standing. Has had two relapses and been in another sanatorium. X-ray showed some activity on left side, but no cavitation. T.B. found in sputum, which ceased within one month of treatment. X-ray after three months showed that the right lung is now practically clear. There are no indications of any extensions or active disease; merely slight fibrosis. The lesion in left lung showed progressive fibrosis with no extension since the last examination.

Case No. 9.—Bilateral disease. X-ray showed infiltration at both apices, with small cavity under left clavicle. This cavity did not give any physical indications of its presence. T.B. found in sputum in large numbers.

Tuberculosis officer reports: "Strongly advised patient to undergo a period of treatment, for the longer he delays the more serious the condition is becoming and the more remote his chances of cure."

After one month lost sputum; made great progress, and has put on weight and able to take active exercise. Seven weeks afterwards X-ray report showed small healed foci at both apices. Few "fluffy" areas of recent infiltration below clavicles, more marked on left side. No cavitation now to be seen. Tendency to healing by fibrosis and calcification is marked.

Case No. 10.—Bilateral disease, with marked activity on left side. T.B. present in sputum. Had several hæmorrhages. After two months X-ray showed a few scattered foci in right lung, mostly healed, with some active ones at the apex, with lower zone slightly veiled. There is a good deal of pleural thickening. Left lung showed fibrosis

and excavation in upper zone; coarse mottled opacities in middle zone (some are healed foci), and there was complete collapse of the lower lobe. Up and about now and doing well.

CASE No. 11.—Bilateral disease of many years' duration. T.B. found in sputum. Disease stated to have begun in left apex, and patient was thought to have made a good recovery. Has had many attacks of digestive tract symptoms, pointing to gastric or duodenal ulcer, and had been under special diet and treatment for previous twelve months. After some two weeks' treatment could take ordinary food without discomfort, and had no more trouble. The bowels became regular without aperients, and sputum soon ceased.

X-ray showed one or two healed calcified foci below the clavicle on left side in the axillary region and some veiling (probably thickened pleura), together with slight mottling at the apex, most likely due to fibrosis. Right lung showed at the apex some fibrosis, infiltration, and small excavation. The upper lobe is somewhat contracted. Up and about and able to take exercise; has done well.

CASE No. 12.—Tubercular laryngitis with active disease in the right lung. No T.B. found in sputum. X-ray confirms lung disease. Has done very well, put on weight of over a stone, taking a lot of active exercise. X-ray now shows left lung normal, with healed foci in hilar glands. Right lung, deficient aeration due to scattered fibrosis, mainly in upper zone. The detail of the middle zone and hilar region is somewhat blurred, and there is some coarse mottling in upper part of lower zone. No marked cavitation is seen.

CASE No. 13.—Bilateral disease in upper zones. Several years' duration. Appetite much improved, has put on weight, takes active exercise. No sputum. General condition good.

CASE No. 14.—Thought to be a case of pulmonary tuberculosis, but X-ray showed only calcified glands. Tubercular laryngitis with ulceration of bowels. Looseness of bowels for over two years. Been in two sanatoria. Temperature 100° F. at night, 98° F. morning, for several months prior to admission.

X-ray showed a marked state of irritability of the large bowel from ascending colon as far as the pelvic colon. Improved.

CASE No. 15.—Bilateral disease. Pleurisy with effusion on both sides with looseness of bowels for over four months. Outlook bad; losing a lot of weight. After six weeks temperature becoming stabilized, and all lost weight regained. Doing well.

CASE No. 16.—Very extensive bilateral disease. Has lost a great deal of weight, and T.B. present in large numbers in sputum. Outlook bad. Now starting to improve.

CASE No. 17.—Bilateral disease of many years' duration. Had an artificial pneumothorax done over five years ago. T.B. present in sputum. Improving.

CASE No. 18.—Disease mainly in right upper zone, with X-ray confirmation. Had been in another sanatorium. T.B. present prior to admission, but none found here. Doing well.

CASE No. 19.—Bilateral disease. Tuberculosis officer reported that there was extensive disease with cavitation in upper zone of left lung and a less marked affection of right lung. Some years ago had

two attacks of pleurisy on left side. T.B. present in sputum. Hæmoptysis persisted for several weeks. Sputum now very little, with no T.B. Improving.

Case No. 20.—Right lung mainly affected with signs of extensive old fibrosis, with cavitation and recent activity in all three lobes. Condition less marked in left lung. No T.B. found in sputum. High swinging temperature for past six weeks. Improving.

Case No. 21.—Bilateral lesions of long history. Poor resistance. T.B. found in sputum. Improving. No T.B. now in sputum.

This short account is only a preliminary report, as it is far too early to express any definite opinion about this new method, but it does appear to show that these remedies produce in time satisfactory results. It is only by independent trials that any new treatment can be fairly judged, but the extent to which my own brief work confirms the more extended clinical experience obtained elsewhere leads me to make this early publication in the hope that others interested in the progressive treatment of tuberculosis may possibly consider it desirable to make their own clinical tests with a view to determining more exactly the extent to which the treatment described improves the prognosis even in advanced cases.

My best thanks are due to Dr. G. B. Bush for all the trouble taken with his reports and skiagrams.

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THE TREATMENT OF PULMONARY TUBERCULOSIS BY LIGHT THERAPY.

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Pulmonary tuberculosis primarily originates from a generalized infection and invasion of the body by the tubercle bacillus. The onset of bacillæmia is difficult to demonstrate by routine laboratory methods owing to the technical difficulties of cultivation and the small number of organisms present in the blood. Lowenstein (1930) was able to obtain 52 per cent. positive blood cultures from investigation of 325 cases of clinical types of tubercular diseases. Recently Dryer and Vollum have shown that atypical types of tubercle bacilli, other than

the classical organism described by Koch, are present in the blood, cold abscesses, and similar tubercular lesions. This may explain why such exudates, although they contain very few "acid-fast" bacilli, as shown by careful microscopic examination, are highly virulent when injected into guinea-pigs. The organization of the general inflammatory process causing destruction of tissues establishes secondary foci of infection and localizes definite lesions of disease. Toxæmia following the circulation and absorption of tuberculin and allied bacterial products, phases of hæmatogenous bacterial infection, and secondary infection of the organized tubercular lesions with pyogenic organisms, summarizes the pathological picture of the mechanism of the progress of tubercular disease.

During the years in which therapeutists have endeavoured to discover a specific cure for tubercular diseases physical methods of treatment have gradually superseded others. Apart from the campaign for prophylactic measures, the maximum general immunity and local healing are obtained by:

1. Exposure of the skin of the body to dry air of equable temperature, pure in quality and free from dust, fog, winds, and rain.

2. Acclimatization to altitude

3. Ideal conditions for control and administration of dietetic treatment.

4. Prolonged periods of complete rest in bed, and later supervised remedial exercises and movements (*i.e.*, mechano-therapy).

5. Pleasant and controlled occupation and education.

6. Skilled surgical treatment when necessary, and other mechanical methods for resting the site of lesions of disease (orthopædic treatment or lung collapse therapy, etc.).

These methods are the "basic principles" of the treatment carried out at modern sanatoria and "open-air hospitals." The exposure to an atmosphere of moving air, sun, and skyshine necessitates the therapeutic application of solar therapy, light treatment, or ultra-violet irradiation.

Radiation therapy lays claim to arrest and heal the non-pulmonary types of tubercular disease. This is generally supported, but the incidental value of the wave-lengths of "light" in the treatment of tubercular diseases of the lungs has given cause for controversy and even disapproval. Many physicians regard solar and other methods of irradiation of the skin as dangerous and harmful. Focal and general febrile reactions similar to tuberculin therapy have been described. The variations in the technique, dosage, sources of light, and the types of cases selected may explain the varying opinions of the results described in current medical literature. In order to heal tubercular disease it is necessary to produce the maximum specific immunity

against the tubercle bacillus and to raise the general resistance and defensive mechanism of the body. Locally the production of analgesia, so as to help the relief of pain, distressing cough, and embarrassed respiration, must be attempted. The stimulation of local bactericidal action of the tissues and tissue fluids will accelerate cicatrization of inflammatory and suppurative foci of disease.

Blasi (1929) has shown that a regular course of treatment by carbon arc baths will increase the phagocytic index against tubercle bacilli in the blood of children aged fourteen months to twelve years known to be suffering from tubercular disease and showing a positive Von Pirquet reaction. Ultra-violet irradiation of the normal white skin is known to increase the bactericidal properties of the blood. The wave-lengths shorter than 3,000 Angström units, which cause erythema of the normal skin, augment the calcium and phosphorus content of the blood and tissues and generally increase metabolism.

Experiments of Tage Helms (1932) and others, carried out in the laboratory on guinea-pigs inoculated with a lethal culture of tubercle bacilli, show that a direct cure and arrest of infection is impossible following irradiation with the carbon arc. The life of irradiated animals is prolonged as compared with control untreated animals and other animals which have received a preliminary prophylactic immunization with vaccine (Calmette). This is due to a strengthening of their immunity. Such experiments have been repeatedly attempted, but are most difficult to carry out successfully, for the technique in the administration of a suitable constant lethal dose of virulent bacilli and the lack of power of such sensitive animals as guinea-pigs to rapidly form antigens against tubercle bacilli have baffled the research workers.

Many physicians have recorded that hæmoptysis, increased pyrexia, increased cough, expectoration, and fatigue follow the exposure of phthisical patients to the sun and artificial sources of light. This appears to be more frequent when the skin of the chest or back of the patient is irradiated. These factors have been the foremost arguments supporting the injurious effect of heliotherapy and ultra-violet irradiation in conditions of pulmonary tuberculosis. It must be remembered that the physical methods of analysis of the sources of irradiation employed in light treatment show that long and short infra-red rays, visible or luminous rays, and long and short ultra-violet rays are emitted. The intensity of each group of these wave-lengths of rays varies with the nature of the source of light employed. Heat or infra-red rays and luminous rays applied to the white skin over the front or back of the chest of patients who suffer from any form of bronchitis or chest lesion causing cough and expectoration will cause loosening of the sputum and increase expectoration and cough. In this way the chest condition may be aggravated and hæmoptysis will result. Further

prolonged exposure to the infra-red and luminous rays will cause fatigue, lassitude, and pyrexia. This is more marked in the white-skinned patients, who show little or no powers for pigmentation of skin.

The heat regulation mechanism in cases of tubercular disease of lung is deranged, probably due to the presence of tuberculin and toxæmia; the superaddition of heat in the form of infra-red or luminous rays will only further disturb the balance of this mechanism. It is therefore essential to adequately control heating of the body during irradiation, and if a warm source of light is used as a therapeutic agent a current of moving air must be made to pass over the patient by the use of suitable electric fans.

Heat in the form of diathermy, hot poultices, or hot dry packs is often used in the treatment of respiratory disease—*i.e.*, pneumonia and acute bronchitis, etc. The action is beneficial, as it has an analgesic and sedative effect, and further relieves acute congestion and hastens the progress of the inflammatory state. Clinically heat will soften tenacious mucus and in this way increase expectoration; this will help the patients in the fact that cough will be less painful and expectoration will require less effort. Apart from acute conditions of active congestion of the lung, heat and luminous rays should only be employed in the chronic consolidated lesion of the lung with fibrosis—*i.e.*, chronic bronchiectasis and organized cavity of lung. Heat and luminous rays can only be safely applied when pigmentation of skin has developed. This is nature's method to counteract overheating of the blood and subdermal tissues, as melanin absorbs infra-red and luminous rays and acts as a screen. Above all, heating the skin must definitely be avoided in the pyrexial and active stages of tubercular disease of the lungs. In these conditions, during the whole period of light treatment a careful check must be made on the blood sedimentation rate, blood fragility, clotting time and bactericidal power of the blood. Overdosage with heat or light will cause an increased sedimentation rate, increased blood fragility, changes in clotting time, delay in the early stage, and finally rapid clotting, decrease and diminution of hæmobactericidal power. These laboratory tests should be carried out as a routine investigation during the early stages of treatment of all acute disease, and in this way the dosage suitable may be determined. Clinically, overdosage or idiosyncrasy to light will demonstrate symptoms of increased cough and expectoration, lassitude and fatigue, mental irritability and sleeplessness.

The ultra-violet rays of wave-length shorter than 3,000 Angström units are absorbed by the living epidermal cells and cause photobiochemical reaction. A local bactericidal agent is produced which slowly passes to the blood capillaries and into the general blood circulation. Locally, after a latent period of six to eight hours an inflamma-

tory reaction is produced, the irradiated skin cells are killed, and six to eight days after irradiation desquamation and finally pigmentation of the skin develop. It follows that the number of skin cells irradiated, and therefore the surface area of the skin irradiated, is of the maximum importance in establishing a suitable dosage with ultra-violet rays. It has been shown that the surface area of skin irradiated is of greater importance than the degree of erythema or intensity of irradiation employed. Using the technique of "short ray therapy" which I have described, the maximum bactericidal response of the blood is obtained by the application of a minimal erythema dose of ultra-violet rays to an area of skin corresponding roughly to one-sixth to one-eighth of the surface area of the body. The skin surface is divided roughly into four areas: (1) the skin over the front of the legs; (2) back of the legs; (3) front of chest; and (4) back of chest. A minimal erythema dose is applied on alternate days to one of these four areas in rotation. During the stage of desquamation the skin area is rested until the process of peeling has completely finished. It is rarely necessary to increase the dose of ultra-violet rays applied until pigmentation has developed.

In the course of treatment of conditions of active and pyrexial types of pulmonary tuberculosis an area of skin equivalent to one-twelfth or less of the body surface—*i.e.*, an area roughly 8 by 8 square inches—should be exposed to a cold source of light, the air-cooled quartz mercury vapour lamp, or the tungsten arc at a suitable distance for a short period—*i.e.*, three or seven minutes respectively. In this way an erythema reaction will be produced without undue fatigue or heating of the patient. Prolonged exposure to a warm source of light causes fatigue owing to the intense brilliance of the source of light and the actual nervous fatigue of the process of irradiation. The skin over the thorax is avoided, the lower limbs, arms, abdomen, and lower portion of the back being selected as the site of irradiation, at first each alternate day and later every day. Careful check is made as to the condition of the patient, weight, appetite, sleep, temperature, pulse, etc., all being watched. Any marked changes indicate that ultra-violet irradiation and dosage need further control. Ultra-violet irradiation therapy is employed to increase and accelerate the blood and tissue immunity against the tubercle bacillus, and the cautious application and correct assimilation of radiation only will aid this mechanism. The wave-lengths of the ultra-short rays absorbed by the skin cause the activation of calciferol or vitamin D from its precursor, ergosterol, present in the skin and fats. Vitamin D increases calcium and phosphorus in the blood and tissues, and in this way irradiation accelerates fibrosis and the organization of active lesions in the lungs.

The injection of "irradiated blood" is another method which may

be employed in the treatment of active pyrexial tubercular disease. Ten c.c. of the patient's blood is withdrawn by means of venepuncture, and is mixed with sterile 1 per cent. sodium citrate solution to prevent clotting. This blood is exposed to the rays of the air-cooled quartz mercury vapour lamp and intensively irradiated by the technique I have fully described elsewhere. This irradiated blood is injected intravenously or intramuscularly by the same method as is employed in auto-hæmotransfusion. The injection of the irradiated blood increases the hæmobactericidal power and promotes leucocytosis.

In conditions of active pyrexial tubercular disease of the lungs a generalized infection has been described; the blood may therefore contain living tubercle bacilli and their correlated toxins. The exposure of such blood to the ultra-violet rays will cause direct bactericidal action, and the injection of "irradiated blood" will also include the absorption of killed irradiated tubercle bacilli. This will stimulate specific antigens and increase immunity against this infection. In addition, the mechanism of non-specific immunity will be augmented. In the practical application of this therapeutic agent there is a reaction following each injection. Increased temperature of 1° to 2° F. for one or two days is observed, but rarely other clinical signs or symptoms are recorded. The injection of irradiated blood is carried out at intervals of three to four days. Careful control of the white blood cell count, blood sedimentation rate, and clotting time should be made. During this treatment examination of the urine should be made twice daily, and chemical and spectroscopic tests for the persistent presence of traces of albumin or the presence of blood pigment (hæmoglobin or methæmoglobin) should be made.

Ultra-violet rays may therefore increase the specific and non-specific immunity of the blood and tissues. Carefully controlled dosage of such radiation applied by the technique which has been described may accelerate the arrest of an active and pyrexial type of disease of the lungs when combined with the other general principles of treatment usually adopted as routine methods.

Tubercular pleural effusions and lesions of the pleura may be treated by the application of an intensive erythema to the skin covering the chest wall over the area of disease. Counter-irritants, such as mustard plaster and poultices, iodine, hot packs, etc., only cause a hyperæmia and reaction of a temporary nature, and the effect only persists in the blood supply of the skin for some hours. A full erythema reaction produced by exposure of the skin to ultra-violet rays will persist for four to five days. The effect of radiation therapy penetrates deeper, and causes an intensive dermal and subdermal inflammatory œdema passing to the subcutaneous tissues, and is followed, six to seven days after irradiation, by desquamation of the

epidermis and later pigmentation. The full effect is maintained for seven to ten days. The rays from the air-cooled quartz mercury vapour lamp are applied to the skin area of the chest wall; each day a surface area of skin corresponding to 6 by 6 inches is irradiated. A full erythema dose is applied to each area until the whole skin area of the lesion has been fully irradiated. Blistering of the skin must be avoided. Excessive irritation of the skin following erythema reaction may be relieved by the application of a lotion containing 5 per cent. camphor dissolved in rectified spirit. In this way ultra-violet rays are employed directly as a counter-irritant, and will relieve pain associated with active pleurisy and will accelerate the absorption of pleural fluid and exudates.

Chronic tubercular disease of the lungs may be safely treated by light therapy. In Denmark physicians have recorded such good results and progress in the treatment of chronic pulmonary tuberculosis that today the use of general ultra-violet irradiation has spread from Copenhagen to all sanatoria and hospitals, and is employed as a routine form of treatment of all cases of chronic tubercular disease. The failures and bad results can usually be definitely attributed to faulty technique and excessive exposure to the rays. Treatment should be started with the greatest caution, and small areas of the white skin should be gradually exposed to the quartz mercury vapour lamp according to my technique of "short ray therapy" until signs of pigmentation are visible. At this stage it is safe to gradually expose the body to the carbon arc, using iron-cored carbons, and the long flaming arc operated by a current of 30 ampères and 60 to 70 volts between the electrodes. During the early stages of treatment it is desirable that the patient should be rested in bed so that careful control may be made as to the effects of irradiation. Treatment with the mercury vapour lamp is given three times a week, and exposure of the skin of the lower limbs is first applied. The room in which treatment is given must be adequately ventilated, and above all the patient must be kept cool during treatment. The skin of the body surface is divided into four areas: (1) front of legs, (2) back of legs, (3) front of chest, (4) back of chest. Each alternate day a minimal erythema dose is applied to one of these areas in rotation. If any area shows desquamation the skin is rested until desquamation has stopped, and another skin area is selected for treatment. In practice each skin area is irradiated once every ten to fourteen days. After four to five weeks' treatment the whole skin surface shows slight pigmentation, and at this stage it is safe to irradiate the skin with infra-red, luminous, and longer ultra-violet rays of higher intensity than the wave-lengths emitted by the mercury vapour lamp, for pigmentation acts as a screen and prevents overheating of the body and penetration of the short

infra-red rays and luminous red-orange rays into the blood capillaries and blood stream. The carbon arc or low pressure vitrosil mercury lamp and tungsten filament lamps similar to that described in my "daylight lamp" are suitable sources of radiation at this phase. On hot days or in warm rooms an electric fan is useful, as a current of cool moving air can be circulated. The skin of the whole body may be gradually exposed to these sources of light. Treatment is given three times a week, and is gradually increased from ten minutes to sixty minutes. The treatment must not cause any fatigue or lassitude. The eyes must be protected against the glare of the lamps. Careful clinical observations must be made during treatment, and any excessive increase in cough and expectoration, pyrexia, restlessness, headache, and insomnia signify that over-exposure and excessive dosage have been given. Such symptoms necessitate that the patient must be rested from exposure to the rays, and when treatment is again started, careful control must be made with the aid of laboratory investigation of the blood—*i.e.*, blood sedimentation rate, clotting time, blood fragility, total blood count, and hæmobactericidal tests whenever facilities make it possible. The work of Strandberg and Von Gravesen has shown a high percentage of successful results in the treatment of pulmonary disease and tubercular disease of the larynx by means of general light baths. The work of such excellent pioneer workers cannot be discarded, and if such results can be obtained in their hospitals, similar success should be obtained in our sanatoria and out-patient clinics. The secret of success depends upon the careful control of the dosage of rays applied. This means that such treatment must be controlled and supervised by a skilled physician who is fully prepared to make a careful study of the physical and biological nature of light. In this way he will gain expert knowledge of radiation therapy, and will be able to apply it as a valuable healing agent.

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THE TREATMENT OF TUBERCULOUS GLANDS IN CHILDREN.

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The incidence of tuberculous adenitis in children has undergone a remarkable change in this country during the past twenty years. Prior to the Great War, tuberculous disease of the cervical glands was one of the commonest surgical maladies in a children's hospital. Nearly every second case seen in the out-patient department was suffering from this complaint. Today a very different story can be told. For instance, there has been a remarkable diminution in the cases of tuberculous glands among the patients treated at the Belgrave Hospital, which may be regarded as a typical hospital for children in London, as it draws its cases from a very wide and a very densely populated area. The five-year period 1909-1913 shows a very significant contrast to that of 1929-1933. In the former period no less than 240 children underwent treatment for enlarged tuberculous glands of the neck ; while in the latter, 18 such cases only were seen and treated.

The secret of this rapid decline in the number of cases of tuberculous infection of the cervical glands is no doubt due to several causes.

Firstly, improved hygiene has played an important part, and will continue to play an even more important part. The old dark, dingy, unhealthy dwellings of the poor are fast disappearing, and their place is being taken by healthy, sunlit tenement houses or flats. Children are better fed, and the value of vitamins in the diet is a matter of general appreciation and application. It may be said that the children of the poorer classes in this country are better looked after than those in any other country in the world today. They are cared for soon after conception by active antenatal bodies, while at a later period their physical welfare is the concern of post-natal clinics, school clinics, and such-like associations.

Secondly, the complete removal of tonsils and adenoids and infected teeth has played an enormous part in helping to prevent tuberculous infection in the cervical glands. In years gone by the non-removal of infected tonsils was the reason why the children of the upper classes suffered only too frequently from tuberculous adenitis, although they had good food, plenty of sunshine, and enjoyed long visits to the seaside. The tonsils probably became infected from the milk. The lymphatic drainage from the tonsil is mainly into the cervical glands. The

lymph gland situated at the angle of the jaw is so frequently involved that it has been called the "tonsillar" gland. From this gland the infection slowly but surely progresses to the other glands in the triangles of the neck, until eventually the whole chain becomes involved. At any time one or more of the glands may caseate, break down, and give rise to a cold abscess. If secondary infection is superadded, then the disease progresses more rapidly than ever. Sinuses appear and treatment becomes progressively more difficult. At best the little patient is left with several unsightly scars in the neck.

The diagnosis is perhaps somewhat more difficult today than it was formerly, because students and practitioners do not see so many cases. As a rule there is a history of some long-standing cervical glandular enlargement, which is gradually but surely progressive. An abscess forms and bursts, and a sinus is formed which discharges thin watery pus occasionally containing solid flakes. If the case is seen at an earlier period of the disease when there is a chain of glands the diagnosis is not so easy; but any tendency to matting of the glands or periadenitis is strongly in favour of a tuberculous condition. The differential diagnosis then rests between subacute lymphadenitis, lymphadenoma, glandular fever, and leukæmia. However, the diagnosis can be definitely made by taking a blood count and removing one of the smaller glands for microscopical examination. If the condition is tuberculous there will be well-marked endothelial proliferation, and definite giant-celled systems can be seen.

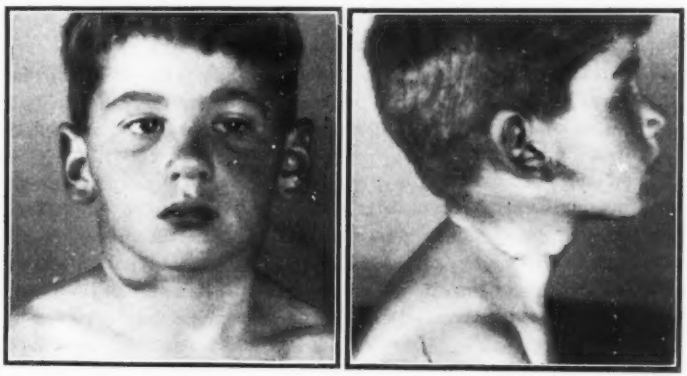
The treatment of tuberculous glands in the neck is just as important today as ever it was. However, preventive treatment should always be aimed at by the removal of septic tonsils and adenoids and the removal of all septic teeth.

Treatment itself may be divided into general and local, and both are of importance. Rest, good food, sunlight, and vitamins are all important. Sunlight or ultra-violet rays are very important as a general measure, but should not be applied locally to the glands. I have found radiostoleum and ostelin most useful in treating young children. Occasionally the glands undergo calcification, which, as in other parts of the body, is one of nature's attempts at a cure.

With regard to local treatment, the removal of tonsils and adenoids is most important. Removal must be complete in every case. In a large number of distressing cases portions only of the tonsils are removed, and the little patients are not a whit the better for the operation. It is a crying shame that students are not taught how to remove tonsils and adenoids in the right and proper way. Very frequently the first occasion on which the young practitioner is called upon to remove tonsils and adenoids is on a private patient or at a school throat clinic to which he has been appointed.

Septic and decayed teeth should be removed. Here again a difficulty often arises, as dentists prefer to keep the temporary teeth in the jaw as long as possible, and often advise parents to have the teeth stopped instead of having them extracted. The medical practitioner should insist on their removal if the teeth are septic and enlarged glands are present in the neck.

In cases where the tonsils and adenoids have been removed and general treatment adopted, should enlarged glands be still present after an interval of three months, surgical removal is indicated. The glands should be dissected out through curved incisions which follow the creases in the neck. No attempt should be made to remove all the glands through one large incision, as was the practice formerly. The



PHOTOGRAPHS OF A BOY AGED EIGHT YEARS WITH ENLARGED GLANDS IN THE NECK.

old-fashioned oblique incisions along the anterior border of the sterno-mastoid muscle, which left unsightly puckered scars, are now of historic interest only. Knowing how nature can deal with enlarged glands, it is not necessary in these cases to make a very complete and radical removal of every small lymphatic gland in the neck, although some authorities still adhere to this practice.

Abscess formation often requires prompt attention. Aspiration has taken the place of incision whenever possible. It is very important to insert the needle at a considerable distance from the abscess where the skin is healthy and has a good blood supply, the reason for this being in order to prevent the formation of a sinus. Repeated aspiration at weekly intervals may be necessary in some cases where the resistance of the patient is poor and the abscess is a large one due to the breaking down of a mass of glands.

In some cases it is necessary to incise an abscess to prevent the skin from giving way. In these cases the abscess is often of the "collar-stud" variety, due to the fact that a caseating gland has broken down beneath the deep cervical fascia, formed an abscess, and the deep abscess has then perforated the fascia, through which it has spread to form another superficial abscess just beneath the skin. In such cases an incision into the superficial abscess is indicated, and a small sharp spoon is introduced into the hole in the deep fascia and the deep abscess gently removed. The wound is then rubbed with B.I.P.P. and closed without drainage. This form of treatment in selected cases has given very good results. It is important not to curette the abscess cavity, as by so doing tubercle bacilli may gain an entrance with the blood stream and set up tuberculous meningitis or miliary tuberculosis.

Enlargement of the mesenteric glands may at times give rise to symptoms which call for active surgical treatment.

Tuberculosis of the mesenteric glands is much more common than in the cervical glands. Quite 60 per cent. of tuberculous children have enlargement of the mesenteric glands, although they are not obvious clinically.

The history of such cases is often vague and the child is not brought under medical supervision until very definite wasting has taken place. The enlarged tuberculous glands give rise to colicky pains in the abdomen and irregularity of the bowels. Diarrhœa is followed by constipation, and this in turn by diarrhœa again. The appetite frequently varies from day to day, and the temperature may be found to be irregular.

Palpation of the abdomen may be the means of proving the existence of the enlarged glands. It is essential that the little patient should be examined in a sitting position, otherwise the muscles of the anterior abdominal wall are thrown into spasm and the glands which are situated on the posterior abdominal wall cannot be felt. As a rule the best place to feel for the glands is just to one side of the vertebral column, more commonly to the left of the middle line. Another quite common place is in the right iliac fossa. In such cases the question of appendicitis naturally arises, but generally speaking a rectal examination will decide the point. In appendicitis some inflammatory thickening will be felt on rectal examination, while in cases of "tabes mesenterica" or enlargement of the mesenteric glands nothing is felt by the examining finger, as the glands are situated beyond its reach.

Although it is not necessary for ulceration of the intestine to be present for the production of enlarged caseous glands in the mesentery, yet quite frequently this is or has been the case.

The treatment of this condition is for the most part hygienic. It can be definitely stated that a prolonged stay at the seaside (Margate

or Broadstairs) will do far more good than any drug in the British or any other Pharmacopœia. The diet also is important. The food should provide the maximum amount of nourishment with a minimum of residue, in order that any possible ulceration of the intestine may not be irritated by the intestinal contents. Fresh eggs and milk are the main stand-by in the diet, but custards, milk puddings and fresh gravy are excellent. Drugs do play a part in these cases, and here again I have found radiostoleum and ostelin prove valuable. Creosote and iodine of iron are helpful in some cases.

Surgery plays a definite part in the treatment of some of these cases when intestinal obstruction seems due to adhesions forming between the enlarged glands and the bowel. Perhaps the best way of illustrating this is to give the history of a case which underwent treatment last year.

Muriel H., aged six years, was admitted to the Belgrave Hospital for Children as a case of acute appendicitis. The child did not appear very ill, but vomited twice a day. Nothing could be felt when the abdomen was palpated, and the result of a rectal examination also proved negative. Two days after admission the condition of the child altered for the worse and vomiting became continuous. It was decided to perform an exploratory laparotomy. A right paramedian incision was made, and on opening the peritoneal cavity some free fluid escaped. A small fibrous band, which passed from a calcified mesenteric gland near the termination of the mesentery to the middle of the transverse colon, was found. Under this band a complete coil of small intestine had become nipped and strangulation had ensued. The simple division of this fibrous band by scissors released the strangulated coil of gut, which gradually assumed its normal colour. The child made an uninterrupted recovery, but I insisted that she should have six months at the sea-side on leaving hospital.

Sometimes the tuberculous mesenteric glands become of large size and then calcify. I have recorded elsewhere a case of a man aged fifty-four on whom I operated for a palpable mobile abdominal tumour and removed an enlarged calcified mesenteric gland the size of a cricket ball.

However, the need for treatment of tuberculous glands will year by year become less and less common as preventive medicine slowly but surely progresses.

PROPHYLACTIC AND REMEDIAL BREATHING AND PHYSICAL EXERCISES.

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THE field of work for breathing and physical exercises is a very large one, and it may be interesting to consider what a variety of applications for their use exists in the treatment of many affections of the body.

It is very unusual to see a perfect act of breathing. The most common faults are marked upper costal breathing, with resulting great neglect of development of the lower costal region, or the injurious belly-breathing which is surprisingly in favour with many people, such as singers and teachers of singing, and which is often a cause of visceroptosis and a general breakdown in health.

Before man adopted the vertical posture he was no doubt a flank breather, and the lower ribs had a free expansion on inspiration, as in the case of many of the lower animals. That this was the case I am quite convinced, because of the ease with which lower costal breathing is acquired in the child of four or five years of age and in the adult of seventy years and over.

All exercises are carried out in a recumbent position, with the body raised from the waist upwards to an angle of 45 degrees.

The development of the chest should commence in the lower costal region. The patient is taught to expand the lower chest on a line with the bottom of the sternum. The effort is a physical one helped by breathing. The idea of taking a lot of air into the chest by forced breathing is quite wrong, and might possibly produce an emphysematous condition of the lungs. I never allow any advance of the abdominal muscles during inspiration. The upper chest remains perfectly still on inspiration after a few treatments. The upper chest is treated by an exercise which consists of a small lower costal expansion as air is inspired. The breath is held and the abdominal muscles contracted at first in three, and later in five, deliberate movements. This exercise expands the upper chest and keeps it fully developed.

The apices of the lungs are developed by an elaboration of the exercise above described. A lower costal expansion is made with one inspiration, then two more inspirations are made, and, as they occur, the abdominal muscles are contracted powerfully: the apices can be seen and felt to be receiving a full supply of air. A further exercise is

given by a movement of stretching an imaginary piece of string held in the hands, which are on a level with the mouth, and as the breathing and physical movements described are performed, and the act of stretching the imaginary string is made, the apices of the lungs are still further developed.

I think it is reasonable to consider that this whole lung development must be a great protection against tubercle of the lung. Possibly the danger of infection to physicians and nurses who are in close contact with phthisical patients might be greatly lessened if care were taken fully to develop the lungs before the patients came under their care. It is not a long process to get a really well-developed lung capacity. Six weeks of exercises give a very excellent development of the chest and lungs. The exercises do not entail hard work, and in a few days the improvement in a chest is easily noted.

I hope most earnestly that this idea may receive consideration, and if there is any virtue in it, that practical results may follow. It is very sad to know that phthisis sometimes overtakes those who give their best to help the T.B. patient.

Now to consider other uses for respiratory exercises: the lower costal breathing is very helpful in certain types of asthma. The emphysematous upper part of the lungs is given less work as the lower chest is developed and a new area of lung put into more active use. The bad asthma patient is frightened when an attack comes on, and the assurance that an effort to get a lower costal expansion will give relief is a great help in getting rid of the tension and forced upper costal breathing which really is aggravating the difficulty of breathing. I remember an officer being sent to me by Adastral House, who had been badly gassed in the war. He used to have attacks of asthma which sometimes ended in unconsciousness. I felt that the severity of the attacks was largely due to fear, and this conclusion proved to be right; the quiet lower costal breathing made the attacks much less severe.

Cases of lordosis, kyphosis, and scoliosis are often under treatment. The deformity of the spine in cases of scoliosis is sometimes accompanied by very marked deformity of the chest, and severe pain is often present. The treatment consists of breathing and stretching exercises. The operator is behind the patient for the latter, and the arms are pulled with increasing strength; and other exercises are given which bend the body the way of the curved spinal column and so straighten out the scoliotic condition. Cases of kyphosis and lordosis are easily treated with appropriate exercises.

A common kind of case is that of the patient with a "patch" on the lung—*i.e.*, an area of congestion or fibrosis after pneumonia—which is generally situated at the base of the lung posteriorly. The

usual exercises are given at first, and later the patient sits on a low stool, the legs are crossed, the hands are clasped below the knee of the leg which is underneath, and the patient pulls the body as strongly as possible on to the thigh of the leg which is over the other leg. As a breath is taken bases of the lungs are felt to be strongly expanding, and, as a rule, in a few weeks the lung is clear of the "patch." I believe that this exercise is the only one which can really thoroughly expand the bases of the lungs. It was shown to me by Dr. H. H. Hulbert many years ago.

Whole lung breathing with special nasal breathing exercises are often given to children who are very liable to colds. The breathing tones up the system, and the air passages of the nose are made healthy by exercises that develop the alæ of the nose and make the membrane healthy. I have a description of these exercises in Dr. Irwin Moore's book "The Tonsils and Adenoids."

Children with poor lung capacity are often backward at school work and find lessons difficult. After a few weeks of breathing exercises a very great improvement has been observed. They were originally not getting sufficient oxygen, and were, as a result, lacking in general tonicity.

This condition of inadequate breathing is a common cause of general debility, and this debility allows infections and illness to occur, which a state of well-being through perfected breathing would resist.

A patient sixty-five years of age was sent to me last year with kyphosis, emphysema and occasional asthma, and for the year previous to my seeing him the asthma had been more severe, and he was conscious of his heart being troublesome. I saw him seven times, and he was then in excellent health. Four months after the treatment finished he wrote, "Your treatment has resurrected me."

Delicate children often put on weight quickly with breathing exercises. Some of the increases in weight have been very gratifying. One boy was 6 st. 12 lbs. in November, 7 st. 6¾ lbs. on January 15, and 8 st. 9¼ lbs in the following October. Another child, a little girl who had pneumonia, was left with a patch on the base of the right lung. I saw her three times in October, and in February her mother wrote to tell me that she had put on nearly 2 stone in weight, and was in every way a different child.

The lack of development of the upper chest is very apparent in children who have had enlarged tonsils and adenoids. The flat upper chest is after a time accompanied by a protrusion of the abdominal wall and a dilated stomach. This in time may, and often does, produce a condition of visceroptosis. I have described visceroptosis and its treatment in the *Lancet* of January, 1925; in the *St. Bartholomew's Hospital Journal* of June, 1926; and again in the latter journal of June, 1933.

As a result of my experience of the treatment by exercises of gunshot wounds of the chest during the war, the successful treatment of visceroptosis impressed itself on me. Very briefly, it came from observing how tremendously the lower chest could be developed in empyema and hæmothorax cases, and this development meant very increased accommodation for the viscera. The abdominal muscles, used in helping to drain wounds of the chest by their powerful contraction with the breath held, acquired very great strength, and it was then obvious that the viscera were being pressed up into a newer and adequate accommodation. So it was that I learned the treatment of visceroptosis.

In the war I had a very large experience of the treatment of gunshot wounds of the chest, and published a paper on their treatment by exercises in the *Lancet* of October 2, 1915, and read one on gunshot wounds of the chest before the Medical Society of London on January 17, 1916 (vol. xxxix. of the Society's *Transactions*). I wrote a further article on the treatment, with several descriptions of cases treated, in the *Lancet* of April 26, 1919. The experience of these cases was of the greatest value to me. Since the war I have treated many cases of empyema in hospital and privately. The conclusion I have come to as a result of my experience of such cases is that the sooner the patient is put on to very gentle breathing exercises the better. I have twice commenced the exercises five days after rib resection, and in the war the average time for commencing the treatment was, I believe, ten to twelve days.

When treating a case of empyema in its early stages the patient is, if possible, raised to an angle of 45 degrees. The bandages are loosened or entirely removed—in which case a dressing is kept in contact with the wound. The patient, who generally is very weak and ill, is asked to take a breath and to try to expand the lower ribs, where the operator's hands are lightly placed. So much depends on the patient's condition as to what can be done in the early treatments. If the patient is very ill, perhaps only four gentle inspirations can be taken at the first treatment. I have set these excercises out as clearly as possible, and I hope the method of using them is quite easy to follow.

After the wound is strongly healed the chest is restored to its normal condition as much as possible by a further set of exercises. There is nearly always a flattening of the upper chest on the side of the empyema, and this can be remedied by a complete set of exercises. This part of the treatment can safely be delayed until the patient has been away convalescing for two to three months.

The Exercises Described.

The exercises are as follows. Only a few should be carried out at each treatment, and the advance through the exercises should be gradual and special exercises selected to suit the individual condition. Each particular exercise should be carried out eighteen times with a rest after each six movements of the exercise. All the exercises should be carried out in a recumbent position with the head and shoulders raised to an angle of 45 degrees.

1. The operator places his hands on the side of the lower ribs level with the breast-bone. The patient should breathe in through the nose, and the lower ribs should be felt to be expanding strongly. There should be as little movement as possible of the upper chest. When the fullest expansion has been reached, the patient should breathe out through the open mouth, and the ribs should be felt to regain their normal position.

2. The patient should breathe in in three distinct movements, and the lower ribs should be felt to expand with each breath.

3. The abdominal wall should be contracted inwards and then allowed to recover its normal position, so that an in-and-out movement is made. (This is a physical and not a breathing exercise, and can be carried out twenty to fifty times.)

4. Contract also in one, two, three separate contractions twenty to fifty times.

5. Combine the above movements—*i.e.*, the patient breathes in through the nose, and the lower ribs are felt to be strongly expanding. The mouth is opened wide and the abdominal muscles slowly and strongly contracted, so that the air is driven from the lungs.

6. The same inspiratory movement, but the breath should be held and the abdominal muscles contracted in three to five deliberate movements before breathing out.

7. The patient should breathe in deeply, the breath should be held and two more breaths taken in through the nose, and, as air is inspired, two simultaneous contractions of the abdominal muscles should be made. The movements send the air to the apices of the lungs.

8. Bend the body away from the side of the injured lung to the fullest extent, so that the uninjured side of the thorax is partially compressed. The patient is on his back, and the head and feet are drawn round as far as possible. The operator should press over the uninjured lung with both hands, and the patient should breathe, as before, in through the nose and out through the mouth, contracting the abdominal muscles as he breathes out. (When there has been considerable collapse of the ribs on the side of the injured lung, and especially when there has been an abscess in the lung, great care must

be taken in doing this movement, otherwise considerable muscular discomfort will occur within a few hours. A certain amount of pain will necessarily be felt if there has been a serious collapse in the chest wall, but this can, of course, be relieved.)

9. The same movement and position, but the operator should press with his hands on the side of the uninjured lung with a pressure of 30 to 60 lbs., and the patient should contract the abdominal wall, with the breath held, at first once, afterwards increasing by degrees to five times.

The following exercises are done with the breath held :

10. Grasp the wrists of the patient as the arms lie at the side of the body, the operator standing behind the patient. Draw the arms outwards and upwards to above the head, pull on the arms steadily when the arms are at their fullest extent, then relax the pull. The patient should then breathe out quickly.

11. Arms as before. Bring them together in front and carry upwards to a right angle. Part the arms strongly backwards and horizontally.

12. The same exercise as the preceding one, but the arms are carried backwards at an angle of 45 degrees upwards.

13. Commence with the patient's arms above the head, with the palms of the hands facing each other. The operator grasps the arms between the wrists and the elbows and presses the arms strongly downwards, and when the elbows approach the sides, the abdominal muscles should contract. Force the elbows into the side and make the patient breathe out strongly.

14. Grasp the right wrist of the patient with the left hand, carry the arm forwards, and bring it to a right angle with the body. The operator should then place his right hand well under the scapula of the patient and pull the arm backwards and downwards as the patient strongly contracts the abdominal wall. Changing the hands, do the same movement on the other arm of the patient.

The best time of day for the exercises is between 4 and 7 p.m. In empyema cases the arm exercises are only used when the patient is thoroughly convalescent.

HÆMOPTYSIS IN PULMONARY TUBERCULOSIS.

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THE immediate treatment of hæmoptysis is one of the biggest difficulties in the symptomatic treatment of phthisis, and it is fortunate for the physician that so few cases are fatal. He can find plenty of treatises on the theoretical action of a multitude of drugs, and articles on the success in individual cases, and then suddenly comes in his own experience to the apparently dramatic result of a "contraindicated" remedy like ergot when every other indicated drug has failed. Usually he finds his best emergency treatment is to enjoin relaxation in a semi-reclined position, to demand complete quiet from the relatives as well as from the patient, to advise the restraint of violent coughing and of deep breathing before cough, and to give an injection of one-sixth of heroin or codein; this is usually sufficient and cannot be harmful. There is much truth in the dictum that if the doctor arrives before the patient dies he can give a good immediate prognosis; he need alter it only if he lays the patient flat on his back and fills him with morphia —a regime all too common, and leading to death from treatment, not from hæmoptysis.

Most drugs advised on a theoretical basis for local circulatory effect are defeated by the fact that the blood-flow of the lungs is a combination of the pulmonary and systemic supplies; we have no sure remedy so far, apart from physical methods, which will enable us to slow down the true pulmonary circulation as an entity, and are left to attempts to affect it only through the general circulation. This is why the vaso-constrictors such as adrenalin, pituitrin, and ergot are said to be "contraindicated" as eventually increasing the blood-flow of the lungs by raising systemic blood-pressure. On the other hand, few physicians dare to use such desperate measures as cardiac depressants even in bad cases, where bandaging the chest wall or the induction of artificial pneumothorax is much more likely to be efficient. It is seldom that good effect can be definitely attributed to the bandaging of the limbs, which after all cannot hope to decrease the blood-content of the right heart on which pulmonary blood-flow must ultimately depend. It is probable that any effect produced by this treatment acts by the forcing into the general circulation of the tissue

fluids with their content of thrombokinase, and so increasing coagulability.

Some observers claim to have proved that the coagulation time of the blood is definitely lengthened in tuberculosis; in any case it seems sensible to use all possible aids to shorten it in hæmorrhage. Salt ought to act on the same principle as limb-bandaging, so it may be given by the mouth or as an intravenous injection—*e.g.*, 5 c.c. of a 10 per cent. solution. Whole-blood injections, intravenous or direct lung injection of hæmoplastin or coagulin-ciba, and subcutaneous thromboplastin or fibrinogen all have their advocates, but for both immediate and lasting effect calcium by injection or by mouth would probably meet with more general support than any other individual drug treatment; certainly it has much apparent success in patients with a history of bleeding with menstruation and in those with "stainings" at frequent intervals. In the end, however, we are driven to admit that in most cases the good results of emergency treatment lie much more in the confidence and calming influence which the presence of the doctor inspires than in any specific drug he may employ, and if he follows the harmless measures indicated above he can then proceed to consider the history and the type of the bleeding, and so try to visualize the possible source and the likely condition of the diseased lung-tissue to aid him in after-treatment.

Many attempts have been made to classify cases between the extremes of the rush of bright, abundant, foamy blood from ruptured vessels and the moderate darker oozing of non-frothy blood in the so-called passive exudates of capillary bleeding, but there must of necessity be much guesswork even with experienced physicians, as physical examination is usually unwise, if not impossible, as an aid to pathogenesis, and we know that while on the one hand it is not uncommon to see the disease progress to advanced bilateral fibrosis and excavation without a single hæmorrhage, it is often difficult to account for repeated hæmorrhages in those with but little infiltration demonstrable by physical signs or X-ray examination. Probably a rush of dark, unaerated blood is from the pulmonary artery, but repeated smaller ones may be from this source or from the bronchial arteries, which are also systemic. Blood from pulmonary veins should be bright and "arterial"; the oozings of "staining" are common in "fat-fibroid" tubercle, in cases of mixed infection where bronchiolectasis or even bronchiectasis may be the direct cause, and in the type of slowly progressive pleural involvement, where a capillary congestion or an area of obliterative fibrosis might produce an overflow and a diapedesis. Between are mixed cases of which we may in emergency only dimly visualise the pathogenesis; fortunately the history, the temperature reaction, and physical and X-ray examination

as soon as practicable will aid in the all-important question of after-treatment.

But few cases demand, by continued or frequently repeated bleeding debarring such investigation, the immediate employment of artificial pneumothorax; dramatic success can follow its use in the most desperate of emergencies, but in such more than the most superficial inspection is impossible, and the physician who employs it on any one side with confidence has generally some previous knowledge of the patient's condition prior to his hæmorrhage.

The true case of "initial hæmoptysis" usually gives no history; he may admit to indefinite morning cough or slight gairy sputum, or to a feeling of malaise and tiredness. There is seldom any temperature, and while added sounds are uncommon the usual sign is lack of movement of the affected lung. It may well be that such cases are due to congestion and engorgement of surrounding lung-tissue over the diseased area, but it is well to remember that some 50 per cent. are found then or immediately afterwards to be sputum-positive. The emergency treatment indicated above is usually enough, followed by "hæmoptysis diet" for a few days. Bleeding is seldom repeated at a short interval, but screening, film examination, and sputum test should follow as soon as possible, and even if he should be sputum-negative and has only the most indefinite evidence of lung infiltration the patient should be sent to a sanatorium for thorough investigation and to learn how to live on a regime to fit his working and social conditions. If he is sputum-positive it is usually wise to advise pneumothorax now rather than later. Far too often no investigation is undertaken and the patient is not sent to a sanatorium; only some two to three years later is this hæmorrhage linked up with a now definite lung infiltration: the patient's fears have been allayed by tales of veins in the throat, bleeding tonsils, and pyorrhœa as the direct and innocent causes.

Hæmorrhage as a first symptom is not necessarily accompanied by such indefinite findings as in the true initial hæmoptysis. Re-exacerbation of a previously unsuspected lesion is commonly demonstrable: apical and upper zone cavitation is often found, and it is well to suspect such a condition if the hæmoptysis is repeated at short intervals. The symptom is usual in cases that have recently had an illness with high temperature and been diagnosed as influenza, whereas the patient has suffered from an upper lobar pneumonic tuberculosis; he has apparently recovered completely in as far as his temperature is concerned; his weakness and tiredness are attributed to the after-effects of his "influenza," but in some two to three months he has a sharp hæmorrhage, and physical signs and X-ray now show a marked subclavicular cavitation, usually in an area of heavy consolidation delimited by definite interlobar thickening. The best treatment for such cases is early

phrenic evulsion: results of pneumothorax are often disappointing, whereas this minor operation will result in most cases in the shrinkage or even obliteration of the cavity. Although not immediately dangerous in their course, they are almost all sputum-positive to first testing, and if left without surgical intervention run a great risk of extension to the mid-zone.

Where the bleeding occurs in known established lung disease it may come from an area of softening and extension. It is then copious and usually "arterial," the sputum is positive, there is fever, and signs of active disease can be found. Such a dangerous type is common in cases previously considered arrested; active measures from pneumothorax up to thoracoplasty are generally indicated. It is not commonly associated with the danger of inhalation pneumonia, which is to be feared much more in cavitation not delimited by interlobar thickening, and especially in mid-zone cavitation. This serious complication ought to be looked for in all cases of hæmorrhage, and in especial where there has been a sharp rise of temperature which shows no signs of subsiding on the fourth day. Examples of such cases with mid-zone cavitation doing well with pneumothorax can be quoted, but they are not usually without gross adhesions which may require severance; and the dangers of tuberculous hydropneumothorax and empyema must be foreseen, so that surgical treatment is generally the best chance for the patient. The same applies to the fibroid types with repeated bleedings from "staining" upwards; they are usually accompanied by fever, and superadded infections are common. Spirochætosis has been demonstrated and bronchiectasis of varying degree, and this adds much to the difficulty of deciding on operation, as a mid-zone spread to the opposite side is unfortunately a not uncommon sequel to surgical intervention.

The re-expansion of artificial pneumothorax is sometimes followed by hæmorrhage. Congestive processes and diapedesis in the re-establishment of blood-flow, and traction on fibroid tissue in the attempt of the lung to refill the pleural cavity, are possible causes. The symptom is naturally very alarming to the patient at this stage of his treatment; the danger of its occurrence can almost certainly be obviated by phrenic evulsion at the time when re-expansion is considered.

A SIMPLE PNEUMOTHORAX APPARATUS.

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In designing the apparatus here described the aim has been to produce a pneumothorax outfit which as far as possible will perform its work mechanically, thereby simplifying the work of the operator.

Like all outfits this has two main component parts—a manometer and an arrangement for the delivery of air to the chest.

The manometer consists of a glass tube 34 centimetres in length, 5 millimetres in internal diameter, with bulbs above and below to accommodate the fluid in sudden or extreme variations of pressure, and connected by a rubber tubing to a reservoir. The manometer fluid consists of a solution of good quality green ink, which retains its colour well. The manometer is in connection with the pleural cavity through one limb of a three-way connecting piece made of copper, to the other two limbs of which are attached rubber tubes carrying air from the bottles to the chest.

The second component includes a metal tap, two graduated bottles, and a special device to control the movements of the latter.

The metal tap is in principle similar to that described by Edwards.[1] The two lateral arms of the tap each communicate with the air contained in one of the two bottles by means of rubber tubing connecting it with a short glass tube passing through the stopper of the bottle. By suitable rotation of the tap, these lateral arms can be brought into communication with either the arm of the tap through which air enters the apparatus, or the fourth arm which is in communication with the pleural space through the tube leading to the needle, when charged respectively with water or with air. By this arrangement, while the air from one of the bottles is passing into the chest through one of the lateral arms, air is entering the other bottle through the opposite lateral arm, the second bottle being thus ready for use as soon as the first bottle is exhausted.

The bottles are of such a size as to contain 700 c.c. of water. The graduations are marked in a different colour on each bottle to allow of easy reference, and from below upwards the graduations read 100 c.c. (from bottom of bottle), 0, 100 c.c., and by hundreds to 500 c.c. The 0 mark, being at the level of 200 c.c. above the bottom of the bottle, is conveniently placed for the beginning of the refill, avoiding the risk of breaking the column of water in the syphoning tubes.

The fluid in the bottles (an acid solution of picric acid shows up

red and blue graduations very well) need never be aspirated below the o mark.

It is a simple matter with the four-way tap to commence each refill from one or other of the o marks, and thus the quantity of air which has been given is very easily read off for record purposes when the optimum pressure has been reached in the pleural space. The small capacity of the bottles, while reducing the weight of the apparatus, in no way renders it inefficient, for when one bottle is exhausted a further 500 c.c. of air is at once available by turning the tap and reversing the relative position of the bottles.

The arm of the tap through which the air enters the apparatus is provided with a wool filter, easily changed; and a second filter can, if desired, be inserted in the course of the rubber tube leading to the needle.

Control of Bottles.—The mechanism by which the position of the bottles is maintained is entirely automatic. Either of the bottles is simply moved into the required position relative to its fellow, and is retained in place.

The mechanism consists of a solid base from which projects a stout spindle. This base is fixed securely to the back of the apparatus, and on the spindle is fitted a metal washer of equal diameter to the base, containing four holes, into which are inserted small tightly fitting corks, which project about $\frac{1}{16}$ inch on either side. A second solid washer is in contact with these. The projecting ends of the corks are therefore in contact, on the one side with the base, on the other side with the second washer.

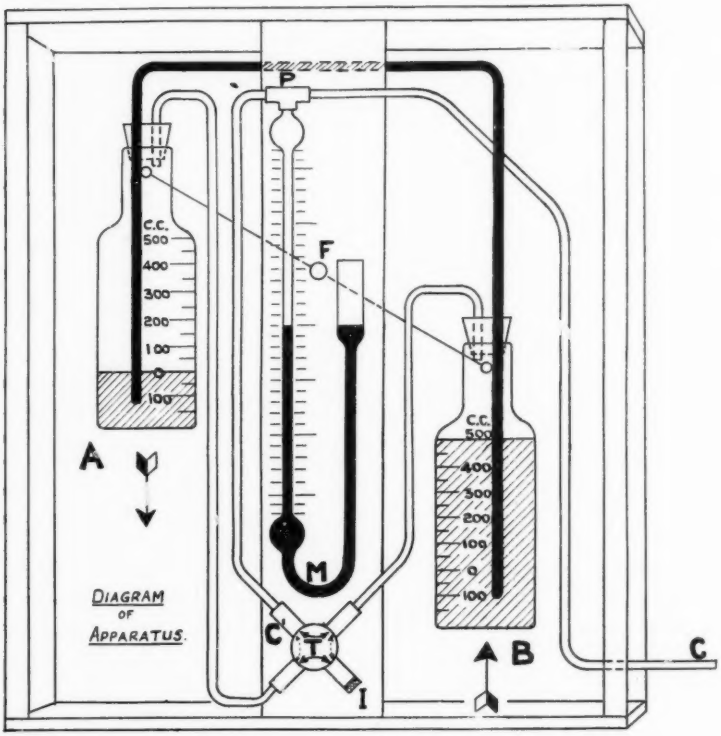
The second washer is pressed home on the corks by a spring, the necessary compression on this spring being obtained by a nut working on a screw-thread provided on the spindle, held when it is in the required position by a lock-nut.

By this arrangement sufficient pressure is easily put upon the corks to hold the full bottle of water in the highest position, and any required adjustment of the level of the bottles is easily made by the hand of the operator.

Assembly.—The diagram shows the method of assembly of the apparatus, designed to allow of the easiest possible manipulation and adjustment. The framework consists of a skeleton box made of unstained waxed oak. The top and bottom of the box are supported by a strong strut at each corner; and a front and back panel carry all the working parts. On the back panel is mounted the metal clutch controlling the bottles, which are attached to arms forming part of the clutch itself; and on the front panel is the manometer with its attached scale and the four-way tap. All rubber connections are arranged at the back of the front panel, to which also is attached the reservoir for

the manometer and a wooden guide in which all the rubber tubes work freely.

The apparatus is of robust construction, and for occasional use can safely be carried in a pair of straps. Fragility has been as far as



A.B. Graduated Bottles. I. Air Inlet. C. Tube to Chest, via P. F. Clutch.
T. Metal four-way Tap. C' Arm of Tap for C P. Metal three-way Piece. M. Manometer.

possible avoided, and the only risk of damage is to the manometer. If this is broken the replacement is simple. A wooden cover can easily be added if the outfit is to be frequently transported.

The overall dimensions of the apparatus are: Height 22 inches, breadth 16½ inches, depth 7¾ inches, and the total weight 15½ pounds.

The apparatus possesses the essential points which it has been stated[2] should be present in an artificial pneumothorax outfit:

1. It is capable of manipulation by one hand of the operator.
2. It delivers the gas at any speed required.
3. The manometer is of water and easily visible.

4. It can easily be made to deliver oxygen by connecting an oxygen cylinder through a reducing valve to that arm of the four-way tap through which normally air enters the bottles.

5. The filter and the parts between it and the needle are easily sterilized.

6. It is portable under modern conditions of transport.

The clutch has been manufactured for me by Messrs. Charles F. Thackray, of Leeds, who are able to supply the complete outfit.

My thanks are due to Mr. W. T. Davies for his generous assistance in the design and making of the experimental models of the clutch.

REFERENCES.

[1] EDWARDS, P.: *Tubercle*, 1931, iii, 103.
[2] BURRELL, L. S. T., and MACNALTY, A. S.: "Report on Artificial Pneumothorax," Medical Research Council, Series 67.

OBITUARY.

ALAN DEED BRUNWIN,

M.A., M.D., B.CH., D.P.H.,
A Consultant Tuberculosis Officer of the Lancashire County Council.

ON June 21 the death occurred in St. Thomas's Hospital, London, whither he had gone for treatment several weeks before, of Dr. Alan Deed Brunwin, a senior Consultant Tuberculosis Officer of the Lancashire County Council. He was fifty-five years of age, and resided at Slyne Lodge, Lancaster.

Dr. Brunwin graduated at Cambridge, taking the degrees of M.A. in 1903, B.Ch. in 1906, and M.D. in 1909. He received his medical and surgical training at St. Thomas's Hospital. In 1910 he took the D.P.H. at Aberdeen.

Brunwin's early appointments were Resident Medical Officer of the Denbighshire Infirmary, and then Government Medical Officer in Fiji. From experience in this island he contributed two papers to the *Journal of Tropical Medicine*: "Observations on Santonin Treatment of Dysentery"; "Some Aspects of Filariasis in Fiji." After a period as Assistant Medical Officer of the Westmorland Sanatorium at Meathop, he joined in 1913 the medical staff of the Lancashire County Council as Consultant Tuberculosis Officer. His appointment for several years was joint with the Blackpool Corporation.

From November 3, 1914, until February 3, 1919, Brunwin was temporary captain in the R.A.M.C. and heart specialist on the staff of the hospital at Etaples in France, provided and organized by the Order of St. John of Jerusalem, and of which Colonel C. J. Trimble, C.B., C.M.G., the present chairman of the Lancashire County Tuberculosis Committee, was in command. He published in the *Practitioner* in 1921 an article on "Electro-Cardiography on Active Service."

On his return from war service Brunwin took control of one of the five large dispensary areas in Lancashire, containing a population of 267,000 and an acreage of 303,000, with a pulmonary hospital at Lancaster, and dispensaries at Lancaster, Preston, and Chorley. His relations with the medical practitioners, medical officers of health, and medical officers of institutions were ever of the most friendly nature; his clinical abilities ensured the complete confidence of all his medical colleagues. With the late Dr. Logan Stewart he did the pioneer work in regard to the treatment of tuberculosis by artificial light at centres established in tuberculosis dispensaries, and the results were published jointly in *Tubercle*, 1928, under the title "Artificial Light Treatment at Tuberculosis Dispensaries in Lancashire."

He married Miss Bessie Trimble, who, with two children, survives.

Brunwin came of a family long connected with the county of Essex. Urbane and kind, possessed with attractive social qualities and a sure knowledge of all aspects of his chosen speciality, tuberculosis, he will be greatly missed by all his colleagues, his patients, and his many friends.

NOTICES OF BOOKS.

VITAL CARDIOLOGY.[1]

Medical literature is growing so rapidly that it is refreshing to find a book which really does give the reader cause for thought by presenting new ideas, even if he cannot accept them all.

The author tells us that "the heart is something more than a series of valves which broadcast a tune," and although he does not go so far as to ignore murmurs, blood-pressure, irregularities, and mechanical methods of examination, he expresses the strong opinion that their importance has been greatly exaggerated. The polygraph and electrocardiogram are concerned with the associated phenomena of the heart-beat, and not with the essentials, and neither of these instruments, he says, can tell the presence of œdema, which can be seen at a glance.

An important chapter deals with the innervation of the heart, and the reciprocal action of the vagus and sympathetic nerves is discussed at length. The former may be considered the conservator of the myocardial reserve, the latter as the agent of action, the one saving or prolonging life and the other making life worth living. These nerves control the rate of the heart, and the author argues that the rate and force of the heart-beat are the two factors which are essential. A heart increases in rate at the expense of diastole, and as the coronary circulation is almost entirely diastolic in rate period, any diminution of diastole lessens the supply of blood to the myocardium. Tachycardia, therefore, is economically unsound and leads to heart failure. Similarly the force of the beat varies with the volume of the ventricles and resistance to outflow, and the reader is invited to study the heart, not according to the orthodox methods, but by regarding rate and force as the two essentials.

This is the new outlook and theme of the book.

Part I. introduces these two essentials, and Part II., consisting of 167 pages, is devoted to a study of rate and force. In this part irregularities and other causes of abnormalities of rate and force are considered, and indications for treatment briefly discussed. Part III. deals with symptoms, such as palpitations, dyspnœa, œdema, and pain; and Part IV. is devoted to treatment.

The indications for treatment are first discussed chiefly from the point of view of relieving the cardiac load and especially dealing with tachycardia. The value of rest and exercise, oxygen, cardiac stimulants, the treatment of œdema, and a final chapter on the use of digitalis are included in Part IV.

This work is the outcome of personal observation and experience more than of reading, and it justifies its claim to present a new outlook. Few will be able to agree with all the views expressed, but it stimu-

[1] "Vital Cardiology: A New Outlook on the Prevention of Heart Failure" By Bruce Williamson, M.D. (Edin.), M.R.C.P. (Lond.), Physician Royal Northern Hospital, London; Assistant Physician Prince of Wales General Hospital, London. E. S. Livingstone, Edinburgh. 1934. Pp. 334. Price 15s.

lates thought, and should be read not only by those who specialize in cardiology, but by every student, if only to act as a warning to them against the modern custom of depending too much on mechanical methods, to the neglect of common sense and clinical observation, for diagnosis. The book can be warmly recommended, and we should welcome other works dealing with different systems of the body in a similar style.

BRITISH SPAS, INLAND AND SEASIDE RESORTS.[1]

This is the official 1934 handbook of the British Health Resorts Association, and is a volume which no practitioner can afford to be without. Here we find a brief note of British spas, including those of New Zealand, South Africa and Canada, with facts as to amusements, climate, rainfall, sunshine, accommodation, and medical indications.

In addition there are many interesting articles on subjects connected with climate and health and indications for climatic treatment.

The Times leading article (September 5, 1934) on the late Paul Klenovsky makes interesting reading, and there can be no doubt that a section of the public in this country is apt to think that in art, medicine, and many other walks of life they get special advantages by dealing with someone or something definitely foreign. So well known is this fact that many a simple Mr. or Mrs. John Bull will adopt a name such as Madame Thisovsky or Professor Thatovitch for business purposes.

The psychological effect of a holiday or "cure" abroad is often beneficial, and the mere fact that the language and customs are altogether different is good, but it is definitely bad for the invalid to think that his one hope is to leave these shores every winter. Apart from other considerations, such a belief will often result in financial hardships not only to the patient, but to his generous relatives.

Anyone who takes the trouble to study the health reports of this and other countries can have no doubt as to the favourable conditions of the British Isles as compared with other countries, and statistics show that for tuberculosis this country is far more suitable than many places which have a reputation amongst the lay public and even amongst some doctors.

We welcome, therefore, this book, which offers so large a choice of health resorts in this country, and we join with the Minister of Health in his wish, expressed in a Foreword, that the Association may have every success.

EMPIRE SOCIAL HYGIENE YEAR-BOOK, 1934.[2]

This is the first number of a work recording the progress made and steps taken to combat venereal diseases in the British Dominions. It will be published annually in place of the biennial publication of the proceedings of the Imperial Social Hygiene Congresses.

The British Social Hygiene Council was established in 1914 to

[1] London: J. and A. Churchill. Price 1s.

[2] Prepared by the British Social Hygiene Council, Inc., with a Preface by the Right Hon. L. S. Amery, M.P., and Foreword by Sir Basil Blackett, K.C.B., K.C.S.I., C.B. London: George Allen and Unwin, Ltd. Pp. 509. Price 15s.

carry out the recommendations of the Royal Commission on Venereal Disease, but since then its work has been much extended. Much of the work is educational, and this is carried out in co-operation with local authorities.

Part I. is a survey of Great Britain and Northern Ireland. The counties and big towns are mentioned in alphabetical order, with such facts as population, death rate, infant mortality, death rate from tuberculosis, cases of venereal disease, mental defectives, and a brief note on biology in the schools. This is followed by a short survey of Northern Ireland, India, and the Dominions and the Colonies.

Part II. contains fourteen articles on such subjects as "What has been done and Possible Future Developments in dealing with Venereal Disease in Great Britain," "Social Hygiene," "Propaganda Methods," "The Position of Biology in Education in Great Britain," "Prostitution in Great Britain and the Colonial Empire," "The League of Nations Enquiry in the East."

The volume is full of information concerning what has been done and is being done to combat a great scourge.

THE HOSPITAL YEAR BOOK FOR 1934.

"The Hospital Year Book for 1934" is the fourth issue of a work full of valuable information to anyone interested in hospital administration. The object of the book is to record the work and finance of the hospitals in Great Britain and Ireland, so that interchange of experience may lead to economy and more uniformity in their administration.

In 1932 the voluntary hospitals received £15,258,897 and spent £14,512,800, thus having a surplus of £746,097. During the same year 1,206,789 in-patients and 5,387,888 out-patients were treated. The number of in-patients are increasing, but during the years 1931 and 1932 there has been a decrease of 123,516 in the number of out-patients treated. It appears that hospitals are using their out-patient departments more and more for purely consultative purposes and for giving special treatment. The general survey for the year 1932 gives ample proof that the voluntary system still has the confidence of the public.

The effect of recent legislation is discussed. The tax of about £1 per ton on fuel oil added considerably to the expenditure of the oil-burning hospitals, so that representation was made to the Chancellor with a view to obtaining exemption for hospitals. The Chancellor found himself unable to grant exemption, and amongst other arguments he pointed out that only fifty-five hospitals in the country were concerned. He quoted the case of a London hospital which in view of the tax converted the fuel from oil to coke at a cost of about £80, and the estimated saving by using coke was £2,000 a year.

The Hospital Section of the Road and Rail Traffic Act, 1933, raises the maximum amount payable by an insurance company to a hospital for the treatment of a motor-accident patient from £25 to £50, and a maximum of £5 for out-patient treatment as a result of motor accidents.

Although the provisions of the Act are limited, the hospitals now are able by energetic action to recover a good percentage of their expenditure on motor accidents.

Complaints that some hospital appeals yield large profits to their promoters with little benefit to the hospitals have been considered by

the Council of the British Hospitals Association, and a Standing Committee has been appointed to investigate the *bona fides* of projects of this kind submitted to it. The Council passed the two following resolutions:

1. "That the general public should be warned against subscribing to any general scheme having as its avowed object the financial support of voluntary hospitals unless it has first been submitted to and approved by the Council of the British Hospitals Association."

2. "That while no objection can be taken to individual voluntary hospitals co-operating in any local scheme for appeal purposes, every precaution should be taken to ensure that such activities do not extend beyond the area normally served by the hospital in question."

There is a list of new buildings or extensions completed by the voluntary hospitals during the year 1932, with the cost, and this is followed by a similar list for municipal hospitals, mental hospitals, and sanatoria. Amongst these extensions will be noted the addition of a solarium to Bridge of Weir Sanatorium.

Memoranda on water supply, including the comparative cost of using artesian wells or other private supplies and supplies from a corporation; the effect of a hospital laundry on water supply; a summary of replies from hospitals regarding the efficiency of synchronized clocks; milk supplies to hospitals; lighting and disinfection of wards, operation theatres, etc.; diet, and the conveyance of food from kitchen to wards; care and storage of radium. Indeed, every possible fact and aspect, including "steps taken to prevent cripples from slipping" and "breakage of crockery" will be found in this most interesting volume. One table gives an incidence of tuberculosis amongst members of the nursing staffs of large provincial hospitals, and shows 1·26 per thousand for trained nurses and 2·39 for probationers.

Articles include a "Financial Review," by Sir Charles Harris; "Outlines for a Typical Constitution and Governing Body of a Voluntary Hospital," by Mr. C. E. H. Lloyd; and "X-ray Work in Small Hospitals," by Mr. H. T. Ferrier.

The second part of the work consists of 132 pages of statistical tables, and part 3 contains a directory of voluntary hospitals, notes on training schools for nurses, recommendations for X-ray and radium protection, work of a hospital almoner, British overseas hospitals, and concludes with an index of institutions.

The book is issued under the auspices of the Joint Council of the Order of St. John and the British Red Cross Society and the British Hospitals Association, and can be obtained from the Central Bureau of Hospital Information, 12, Grosvenor Crescent, London, S.W. 1.

REPORT OF THE MINISTRY OF HEALTH, 1933-34.

We have received the fifteenth annual report of the Ministry of Health. It contains a complete account of the Ministry's activities during the year 1933-34, and sheds some very interesting light on the day-to-day working of a great Government department. It can be obtained from H.M. Stationery Office, price 6s. (Cmd. 4664).

The volume is divided into six parts—public health, housing and town planning, local government and local finance, administration of the

poor law, national health insurance and contributory pensions, and the Welsh Board of Health.

Twelve pages are devoted to tuberculosis in England and a further four pages under the Welsh section.

At the end of last year there were 21,308 beds available for the treatment of tuberculosis in institutions belonging to local authorities in England. In addition there were 8,140 beds in approved institutions belonging to voluntary bodies.

There were 464 tuberculosis dispensaries, excluding special clinics and hospital out-patient departments.

It is interesting to note that whereas in 1920 there were 3,780 ex-service men receiving treatment for tuberculosis at the cost of the Ministry of Pensions, this number has now been reduced to 308.

Tables show the vast amount of work being done in regard to tuberculosis, the contacts examined, the number of sputum tests, of X-ray examinations, of dispensary attendances and home visits and visits by nurses and health visitors, etc. It is true that other tables show a decrease in the number of deaths from tuberculosis, but the cost of such improvement is apparent.

Dealing with housing, the report describes the present housing policy, which is directed to the increase of the supply of houses and the elimination of the slums and the proper rehousing of their inhabitants. A brief forecast is also given of the Government's plans for a direct attack on overcrowding. There is a particularly interesting passage on the powers of local authorities to maintain houses in a state of good repair, and figures are given of the actual amount of repair work secured. During the year 1932 one and a half million houses were inspected in the exercise of those powers by the local authorities and 559,000 houses were made fit. The Minister observes that this forms a valuable contribution to the improvement of the housing conditions of the working classes, and urges that inspection for defects should be carried out in a more systematic way. Finally, there is a section on the provision of new houses. The withdrawal of the subsidy is explained, and the report says: "Statistics obtained since the Act was passed give reason to believe that the Government's reliance upon private enterprise as the main source of the future supply of working-class houses was not misplaced. The number of new houses provided by private enterprise in the six months following the discussion of the Bill in Parliament was 87,088, or 24,632 more than in the corresponding six months of the previous year. During the twelve months ended March 31, 1934, private enterprise built without subsidy 207,869 houses." This is a record figure.

The section entitled "Special Survey of Public Health Services" is of special interest. Few members of the public realize the enormous change in the administration of public health services which was effected by the Local Government Act of 1929, or the potentialities for further development which are presented by that Act.

The Act has given local authorities their first opportunity of looking at the medical services provided in the district as a single whole, for it is only under this Act that the poor law and public health services have been concentrated in the hands of the same authority, while for the first time co-operation with the voluntary hospitals is made a statutory requirement.

Similarly the general surveys of the regional medical services of local authorities by medical officers of the department, which have replaced the scrutiny of individual services in isolation from one another, has provided the Ministry with the first opportunity for weighing the merits and defects of these local services as a whole.

The survey section of this year's report gives an historical account of the gradual development of these services under the public health and poor law, and their expansion as fresh needs arose and improved standards were expected. It describes in some detail the measure of success which has so far been attained by local authorities in carrying out the policy of the Act, and indicates certain difficulties which have been found and the means of overcoming them. The striking improvement in the rates of mortality and in the general public health which has taken place during the last generation testifies to the vital importance of our local public health services. That there is further work to be done and further difficulties to be overcome in this field admits of no denial, and nothing is more likely to promote success in this work than an educated public opinion as to the nature of the problems to be tackled.

It is with this object that the opportunity has been taken to include in this year's report a full review of the public health services under the conditions created by the Act of 1929.

The report contains much useful information, and anyone taking part in the local government of this country should not fail to read it.

MANUALS FOR MEDICAL ADVISERS AND WORKS OF REFERENCE.

Dr. H. Letheby Tidy's justly popular concentrated compendium of medicine, first issued in 1920, has now reached its sixth edition.[1] Of all the medical synopses now available this is undoubtedly the most complete and serviceable. For students preparing for final examinations and for practitioners desiring a convenient and practical guide for ready reference, it is a work which cannot be commended too highly. It is, indeed, a veritable *index medicus*. Since the publication of the fifth edition in September, 1930, important advances in our knowledge having bearing on clinical medicine have been made. This has necessitated considerable revision, particularly in regard to Diseases of Deficiency, Osteomalacia and Vitamins. The sections on Anæmia, Nephritis, Endocrine Glands have been rewritten and lengthened. The section on Parathyroid Glands now occupies thirteen pages, and there are new articles on Generalized Osteitis, Fibrosis, Tetany, and Calcium and Phosphorus Metabolism. Many other articles have been entirely or extensively rewritten, and there are numerous new articles. It is essential that medical superintendents of sanatoria, tuberculosis officers, and all having to deal with tuberculosis, should keep themselves well acquainted with the march of medicine, and this is made possible by a systematic consideration of Dr. Tidy's comprehensive and up-to-date synopsis. In the section devoted to Specific Infectious Diseases there is a comprehensive chapter of forty-three

[1] "A Synopsis of Medicine," by Henry Letheby Tidy, M.A., M.D., B.Ch. (Oxon), F.R.C.P. (Lond.), Physician to St. Thomas's Hospital. Sixth edition, revised and enlarged. Pp. xvi + 1112. Bristol: John Wright and Sons, Ltd. 1934. Price 21s.

pages. Accompanying the section dealing with Pulmonary Tuberculosis is an excellent table indicating in schematic form chief points relating to the morbid anatomy of chronic pulmonary tuberculosis. It should be noted that the work provides a serviceable summary regarding the treatment of diseases considered. By the use of scientifically selected type, distinctive headings are provided which add greatly to the utility of the volume as an attractive synopsis for systematic consideration and rapid reference. There is also an ideal index. We have nothing but praise for Dr. Tidy's fine work, and the publishers have admirably co-operated in producing the volume in a worthy form.

A thirty-fourth edition of the annually published Guide to Continental Health and Pleasure Resorts is a serviceable directory for medical advisers and others desiring information relating to health and holiday resorts abroad.[1] References are given to some 600 resorts and over 1,500 hotels, pensions, cure establishments and schools, including lists of medical and balneological establishments, clinics and sanatoria for tuberculous subjects. A section is devoted to educational centres and another to travel by sea. There are also serviceable schematic maps. The volume is admirably printed and generously illustrated.

PAPWORTH ANNUAL REPORT.

This record of the progress made at Papworth Village Settlement should be read by all interested in tuberculosis.

Whereas in 1918 the Papworth industries paid £174 in wages and sold £401 worth of goods, in 1933 the wages paid were £25,000 and the goods sold £88,000. At present even Papworth can deal with only a small portion of the tuberculosis problem, but its steady development suggests the possibility of developing other colonies to carry on the excellent work in other parts of the country. At Papworth there are now 400 patients and a village population of 600. The village contains a hall where a variety of entertainments are given, workshops where the patients can obtain employment with a choice of several industries and receive good wages.

The most striking innovation, however, is the provision of a special surgical block. This contains the most up-to-date operating theatre and X-ray apparatus. It has over twenty beds, and thoracoplasty and indeed all forms of surgical treatment will be available for the patients.

Papworth is not merely a colony of people with chronic or arrested disease, but a growing institution where patients in all stages of the disease may go and receive the most modern treatment, and gradually, as they return to health may find employment and earn their living, steadily working their way up as health improves.

We have received the report of the Medical Officer of Health for Glasgow for the year 1933.

The estimated population was 1,103,357, and the number of beds in institutions for tuberculosis was 1,701. There were 1,616 cases of pulmonary and 994 of other forms of tuberculosis notified during the year, the deaths from pulmonary tuberculosis being 909, or 824 per million living.

[1] "Twentieth Century Health and Pleasure Resorts." Thirty-fourth edition. Pp. 476, with illustrations. Lausanne: Anglo-Continental and International Publishing Offices, 3, Boulevard de Grancy. 1934.

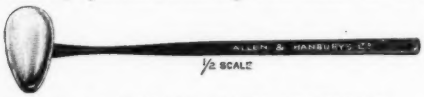
Improved housing conditions enable a patient to be isolated at home, and is especially useful in a chronic case after preliminary sanatorium treatment. Steps have also been taken to rehouse members of a family when one is suffering from o pen tuberculosis. These measures ought in time to reduce the demand for institutional accommodation for the type of patient who can expect no benefit from treatment but should be isolated in the interests of others.

Another interesting feature is the provision of ten beds in Robroyston Hospital for the treatment of cases of abortion in co-operation with the Royal Maternity Hospital.

Whilst the deaths from pulmonary tuberculosis per million living have fallen to 824 from 889 in 1932 and 865 in 1931, those from tuberculosis meningitis have been reduced to 96 from 134 in 1932 and 153 in 1931. This great reduction would appear to reflect the improved housing conditions.

PREPARATIONS AND APPLIANCES.

THE DR. WATSON SMITH PERCUSSOR is a serviceable appliance which physicians dealing with chest cases will appreciate, providing as it does a helpful accessory in the conduct of clinical examination by percussion.[1] It measures only 5 inches over all, and can be readily carried in the doctor's waistcoat pocket. The head is acorn-shaped, one end being rounder than the other. The handle is constructed of whalebone.



THE DR. WATSON SMITH PERCUSSOR.

THE "SANDRINGHAM" GARDEN SEAT.

THE "SANDRINGHAM" GARDEN SEAT, which, owing to the hinged back, is always clean and dry, is made by Kelling Sanatorium Industries,

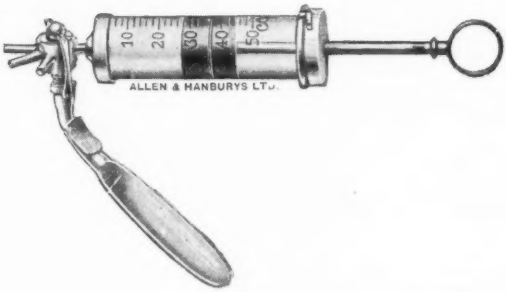
[1] The Dr. Watson Smith Percussor, price 3s., is made by Messrs. Allen and Hanburys, Ltd., Bethnal Green, E. 2.

Holt, Norfolk, and was seen by the editor of this JOURNAL when visiting Kelling Sanatorium during the Annual Congress of the Royal Institute of Public Health in May last.

The price of seat is 30s., carriage paid to any station in England and Wales (Scotland 2s. extra); but seats can, if desired, be fitted with wheel and hinged foot-rest at extra costs of 7s. 6d. and/or 5s. respectively. These attachments are a great convenience, though not a necessity in all gardens.

If seats in oak or teak are preferred the prices respectively are £3 3s. and £3 13s. 6d without the attachments mentioned above, but these can be fitted if desired at extra charges of 7s. 6d. (wheel) and 7s. (foot-rest).

Illustrated pamphlets can be obtained from the Secretary, Kelling Sanatorium, Holt, Norfolk, to whom all orders and enquiries should be addressed.



The three-way syringe illustrated here will be found very useful for washing out the pleural cavity. For ordinary aspiration a two-way syringe is all that is needed, but if some solution is to be introduced into the chest, a third outlet is convenient. If necessary, the syringe can be used to introduce air into the pleural cavity after the wash out.

The coned metal unit is held comfortably by the handle, and the change of direction of flow is obtained by moving the syringe in a horizontal plane to each extremity, which thus forms a completely straight line with perfect registration with the outlets, and ensures an absolutely unimpeded flow.

The central plug of the flow-directing unit is held in position by the spring attachment provided, and the whole can be easily disassembled for sterilization.

The syringe, which is supplied by Messrs. Allen and Hanbury for £5 10s., is British made and has a capacity of 50 c.c.

INDEX

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